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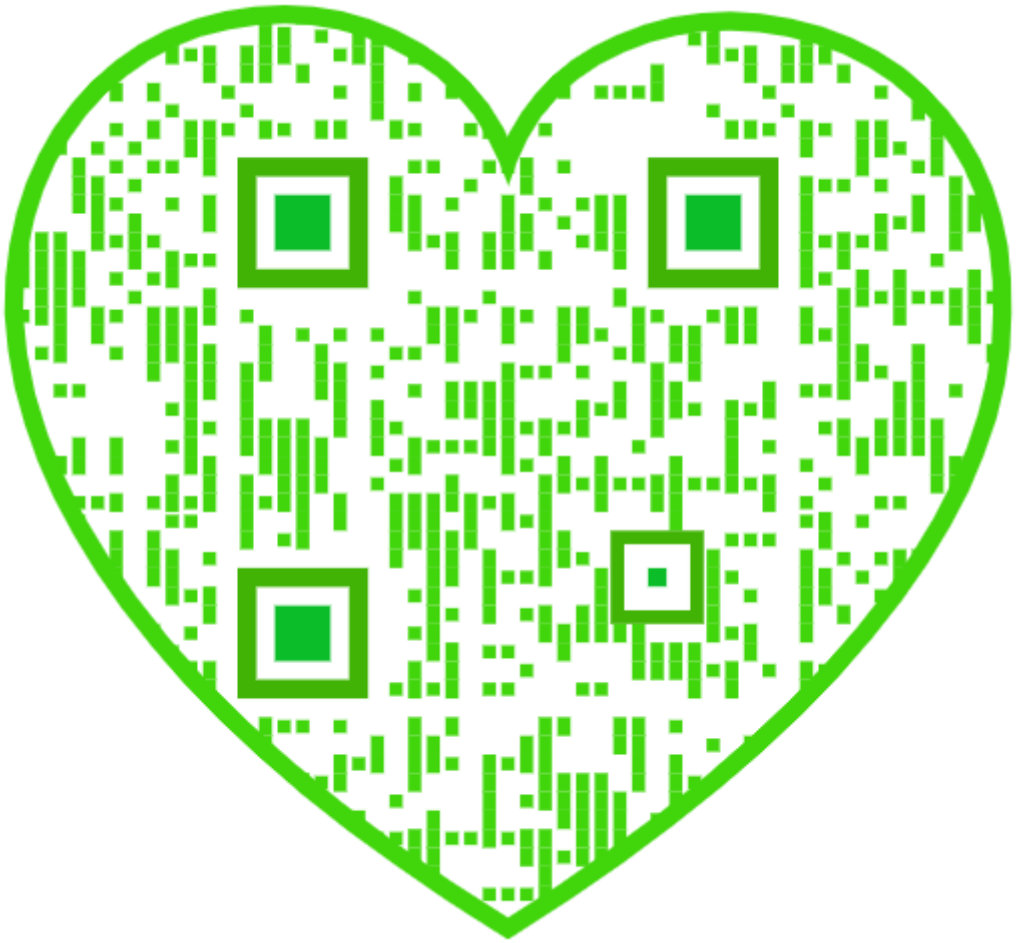

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73

Magazine

Wayne Green W2NSD/1
Editor, etcetera

October, 1963

Vol. XIV, No. 10

Do It Yourself WBFM Transceiver	K5JKX	8
Why Johnny Ham Can't Hear	W6VAT	12
Why Fight Ohm's Law?	K5HPT	16
Tri-Element Remotely Tuned Yagi	WB2CQM	22
Rules of Thumb	W5IUR	28
Combination Antenna Coupler	W3WPV	30
The Minute Motor	W3WPV	36
Filament Transformer Conversion	W5VOH	40
144 mc Nuvistor Converter	W9DUT	44
The Portable HE-35	W3IKH	50
Buyer's Guide	Staff	56
Product Detector	K5JKX	76
Mobile Transceiver Construction	K5MWH	78
A Novel Type High Capacitance VFO	YU1FR	86
Radio Astronomy	WA2BWQ	92
The Big Switch	W4STX	94
Double Power for CW	W2EZJ	96
Panadaptor Converter	K6VNT	98
Compact Transistor Circuits	Pullman	100

Propagation Chart 20
$5 Vertical 35
Coil Winding Hint 89
Transistor Mounting 91
Attention: Club Secretaries 97
New Products 21, 87
Coax Fitting 77
Letter 87

73 Magazine is published monthly by 73, Inc., Peterborough, N. H. The phone number is 603-924-3873. Subscription rates have just been hiked (after considerable warning) to $4.00 per year, $7.00 for two years, $10 for three years world wide. Second class postage is paid at Peterborough, New Hampshire and at additional mailing offices. Printed in the U.S.A. Entire contents copyright 1963 by 73, Inc. Postmaster: please send form 3579 to 73 Magazine, Peterborough, New Hampshire. Save your eyes for the 19 pages of Buyers Guide, don't read this lackluster inconsequential.

de W2NSD

never say die

We had planned to have a nice four color cover this month, but so far I haven't received and color pictures that were really worth the extra effort. Our VHF station still is only partly assembled, so that was out. Send in those pictures so we can have a nice color cover.

More Help

One of our biggest problems here is the lack of people to get everything done. When you consider that it takes about 30 people to put out CQ and we have total paid staff of four plus Virginia and myself, you can perhaps appreciate that even high efficiency doesn't quite close the gap. We need more staff here.

We are still keeping our subscription and advertising rates low by keeping down salaries, so we don't have an awful lot to offer in money. The usual starting salary is $50 (plus room and board, which does make it a bit more attractive), with raises as we see results. Living is quite reasonable up here in the mountains and $50 goes a long way. We have some fringe benefits too, like Blue Cross, lunch breaks, free parking, etc. Perhaps you might count in little extras like operating our mountain top ham-shack.

What do we need? Well, we sure have a need for a technician that can build anything we need, repair our gear as fast as it burns out, hook up new gear and test it, and so forth. Then we need someone to take charge of the circulation of the magazine, seeing to it that every known parts jobber is pressured until he carries 73 on his counter, keeping track of the fortune that we are losing on our newsstand sales (I figure we lose 5c for every newsstand copy sold), chasing expired subscribers until they renew their subscription, etc. This is a good job because it doesn't take any previous experience, only the ability to work hard and get things done.

Every now and then I look helplessly at the growing pile of mail that I'll never be able to answer. I could use someone who can write letters and who has a fairly good ham background to take 90% of these away from my desk. We could use some help in preparing articles for printing too. There are lots of things to be learned here for the fellow who wants to work. After a short time you could find yourself somewhat of an expert on letterpress and offset printing, printing production, magazine production, typesetting, layout, photography (including developing and printing pictures), operation of a copy camera, offset press, platemaking, paper purchasing, artwork, bookkeeping, accounting, radio repairs, tower climbing, antenna tuning, contest operating, and much, much more. And you'll learn more about the inside workings of ham radio than you ever imagined existed. You'll learn things that can never be put on paper.

Interested? Drop me a line and plan on spending a couple of weeks with us as a trial to see how you fit in with our group and how you are able to grab hold of things. We all get along marvelously and there just isn't time for me to include a psychotherapy treatment for newcomers.

If you're married there are apartments here in town for about $75 a month that are just fine. If you're not living in we can up the ante a bit.

New Hampshire is one of the most beautiful parts of the country and even our winters are short and beautiful. The snow last year lasted just three months and I never had to shovel it once. They really keep it clear up here.

So, if you're interested in a permanent job in ham radio, or even if you want to learn about publishing and printing, you might give some thought to working up here.

6-UP

Things have gotten out of hand. I had planned to put out a small (16 pages) monthly bulletin with an eventual circulation of maybe 2000. From the experiences of VHF

(more on four)

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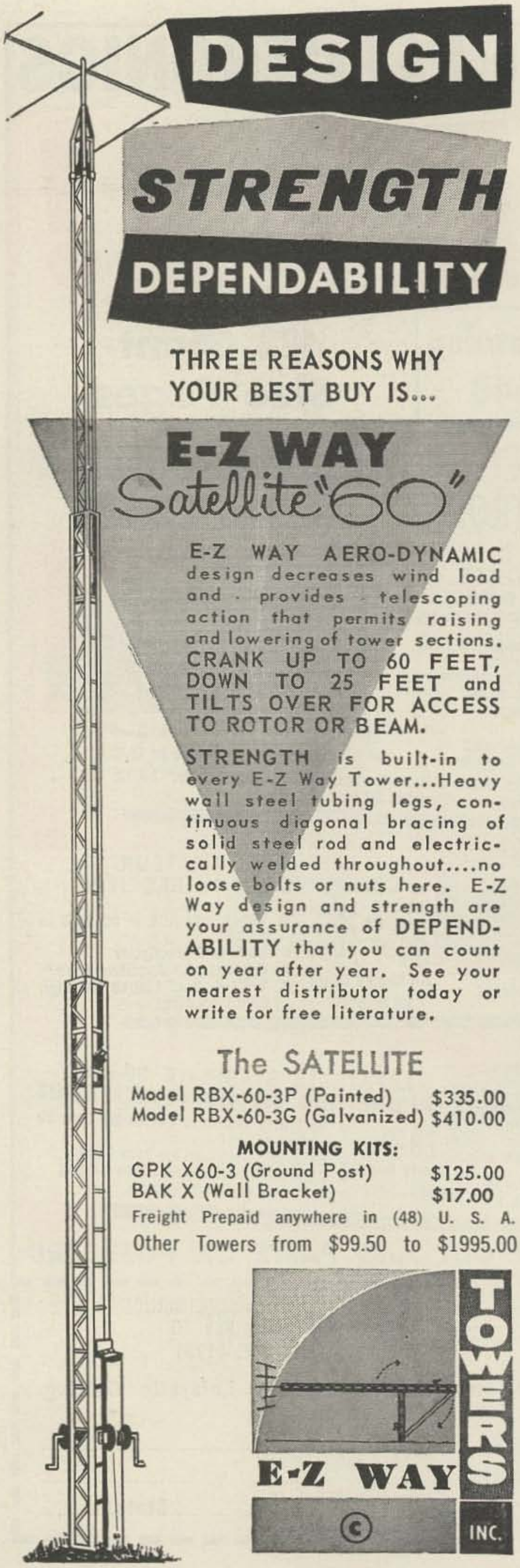
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Amateur and VHF Horizons, this seemed like a reasonable estimate.

Jim Kyle sent in the copy for the first issue, 16 pages, and we ran off 1000 copies on our little offset press. It was a good issue, with a couple of terrific articles on Wide Band Balun Design and on SSB T-Pad design. We ran no ads in the first issue. The idea behind 6-UP was that we could run articles that were of interest only to the VHF'er and thus might not find room in 73. The fast press dates involved assured that the magazine would be in the hands of the readers in days after news occurred instead of the usual weeks or months.

By the time the last copy was off the press the 1000 copies had been sold out and subscriptions were backing up. We printed 1000 more. Most of these are gone now. On the basis of this circulation I set out a letter to VHF manufacturers setting a ridiculously low ad rate of $10 a page. Then it happened!

Bob Cooper, publisher of VHF Horizons, called and within a short while we had a deal whereby 6-UP would take over the Horizons mailing list. Suddenly our circulation was up to almost 6000! Several advertisers took us up on our ad rates and this brought our second issue up to 32 pages. Our paper supply that was supposed to last for six months (2000 copies 16 pages) disappeared into the press as we ground out 6000 copies of 32 page magazines. Dan W1AER ran the press for almost 24 hours straight getting the issue out on time. Ted K9YOE just about ruined his arm cutting paper and trimming magazines. Fred W1NJL, taking time off from contests, did his best to get the pages in the worst possible order, figuring that any VHF reader worth his salt should be able to sort out the jumble. Jim WØDSU had a lot to do with the unbelievably crooked folding that resulted. The first thousand copies were sort of fun, but by the 6000th enthusiasm had flagged to a new low.

Needless to say we are increasing the ad rates a bit to hold down the number of pages of ads. $30 page, $15 half page. Bargain.

Further Ham Tours

Our trip to Europe has worked out so successfully that we want to start planning more such trips. Pan American has a round-the-world flight which costs under $1000. This seems like a lot of money, but few people manage to include a round-the-world trip into their lives . . . and it is something that you'll never forget, as long as you live. The hotel and incidental costs would be on top of that, but

(Continued 98 pages later)

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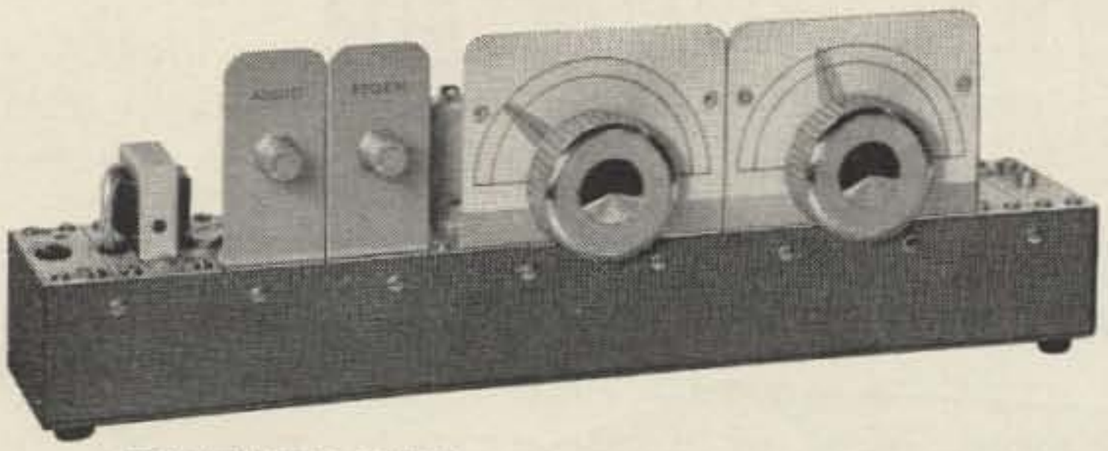

RECEIVER KITS

This new line of International receiver kits cover a wide range of amateur, citizens band and special frequencies. Designed for AM, CW, or SSB reception, this basic receiver using a superheterodyne circuit* with regenerative second detector may be expanded to a more elaborate receiver by the addition of other Add-On-Circuits. Sensitivity usable to below 10 microvolts for voice and 1 microvolt for code. Nuvistor rf amplifier, mixer, oscillator, I.F. transformer, detector/1st audio, and power audio amplifier. Tube lineup: 6DS4 nuvistor, 6BE6, 6U8, 6AQ5. Shipping weight: 15 lbs.

Receiver kit includes 4" speaker and power supply.

Kit	Frequency	Price
AOR-40	Special	$69.00
AOR-41	150 kc — 450 kc	62.50
AOR-42	2 mc — 6 mc	62.50
AOR-43	6 mc — 18 mc	62.50
AOR-44	80 meter/40 meter	62.50
AOR-45	15 meter/10 meter	62.50
AOR-46	6 meter	66.50
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AOR-48	Citizens 27 mc	62.50

*AOR-41 uses a tuned rf circuit with 6BA6

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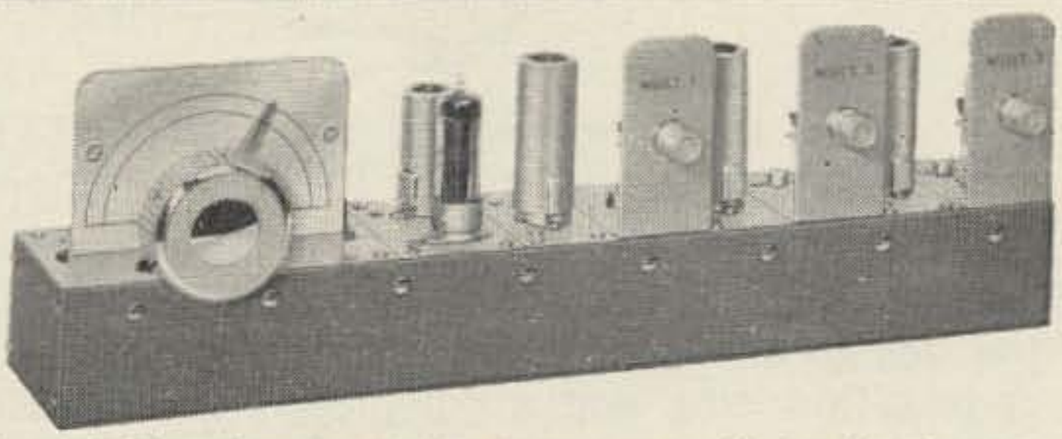

VFO KITS

The International AOF series of variable frequency oscillator kits is available in three versions. For example, the AOF-91 kit is a complete driver unit to be used with 6 meter and 2 meter transmitters. Approximately .5 watt of power is available on both bands. Tube lineup: 6BH6 oscillator, OB-2 voltage regulator, 12BY7 buffer-amplifier/multiplier. Shipping weight: 5 lbs.

Kit	Frequency	Price
AOF-89	VFO 8 mc — 9 mc and buffer	$22.00
AOF-90	VFO 8 mc — 9 mc plus buffer multiplier and 6 meter output	29.00
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As the result of the acquisition of Clegg Laboratories by Squires-Sanders, Inc. (see page) the design and production of more and better new Clegg products will move forward rapidly. Excellent financing and a completely ham oriented program have resulted in vastly improved test, quality control and manufacturing facilities and, as the VENUS 6, the first in this new line of products makes its bow, its superior design and construction features will be readily apparent.

The VENUS 6, a high quality compact attractively styled SSB RECEIVER and TRANSMITTER, puts you on 50 Mc single sideband without all the fuss, bother and expense associated with adapting low frequency SSB exciters, relays and linear amplifiers, Its 20 tubes and 4 semiconductors provide performance equivalent to 35 tubes.

The VENUS employs all the latest circuit techniques including crystal lattice filter, balanced beam tube modulator, low noise NUVISTOR front end and the newly conceived RECEIVER OFFSET tuning.

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Clegg Laboratories, well known for high-performance VHF equipment — the Zeus transmitter, Interceptor receiver, Thor 6 and 99'er 6 meter transceivers — has recently become a division of Squires-Sanders, Inc. Amateurs interested in VHF will find that this means a vastly better Clegg — as the result of excellent technical support and financial backing, plus association with a company whose entire interests center upon superior amateur communications equipment.

Squires-Sanders recent technical innovations, which have resulted in a truly remarkable line of HF amateur equipment, give this announcement even greater significance to the amateur fraternity. The combined product lines will thus include equipment of the highest quality for *both VHF and HF* — produced by a company whose principals have both a strong professional and technical background and a deep interest in amateur radio.

D. F. SANDERS, President

A founder and president of Stavid Engineering, Inc. and subsequently president of Lockheed Electronics Company. Squires-Sanders Directors include ALDEN R. LOOSLI, General Manager, Fibres Division, American Cyanamid; RANDOLPH B. MARSTON, Associate of Laurance S. Rockefeller; and JAMES W. WALKER, Vice President of Brady Security and Realty Corp.

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Former Chief Scientist for Lockheed Electronics Company and previously with the Rand Corporation, president of Telemeter Magnetics (now a division of Ampex), and supervisor of advanced development for the Radio and Television Division of Sylvania Electric Products.

EDWARD T. CLEGG, W2LOY, Clegg Laboratories Division

A founder and president of Clegg Laboratories since 1951. Formerly vice president of Transistor Devices, Inc., of which Clegg Laboratories was a division. Responsible for many original developments in VHF communications equipment, including all Clegg amateur products. Extensive prior background in military communications and countermeasures.

SS-1-R is the designation for the first *Squires-Sanders* product — a 3.5 to 30 MC, amateur band, AM/SSB/CW receiver having performance characteristics superior to previously available equipment. The SS-1-R will feature unparalleled freedom from overload and cross modulation* plus excellent sensitivity, selectivity and image rejection. Digital read-out of frequency, automatic all-band calibration with WWV and a motor driven tuning mechanism are just some of the unusual refinements. A pre-IF noise silencer accessory that literally eliminates the majority of impulse noise will complement the receiver.

The SS-1-R and the Silencer are already "on the air" in field testing. They will be available at your favorite dealer soon.

*See "A New Approach to Receiver Front End Design", W. K. Squires, QST, September 1963

Squires - Sanders, Inc.

475 WATCHUNG AVENUE, WATCHUNG, N. J.

Do it yourself

WIDE BAND FM TRANSCEIVER

Jim Kyle K5JKX
1236 N.E. 44th Street
Oklahoma City 11, Okla.

For quite some time now I have been bandying about "idea" articles in these pages—so we might as well warn you at the outset that this is another of them. The gadget hasn't yet been built, but on paper offers a relatively simple way for anyone interested in wideband FM work (there's a lot of it going on) to get there even if he can't obtain a surplus police, etc., unit.

The major innovation presented here is not really new, having been used by the military in the BC-1336 years ago, but hasn't had as much attention as it deserves. That is the use of a single crystal to control frequency of both the transmitter and the receiver in a superhet; this both cuts crystal cost in half and allows virtually instant frequency change within the limits of the most-often-used parts of any FM band.

Since the purpose of this article is to stimulate ideas rather than to present a blow-by-blow account of how to build such a gadget, the system design has been left in block-diagram form as shown in Fig. 1. Of the 10 tubes envisioned, seven are in completely conventional circuits and will not be discussed further.

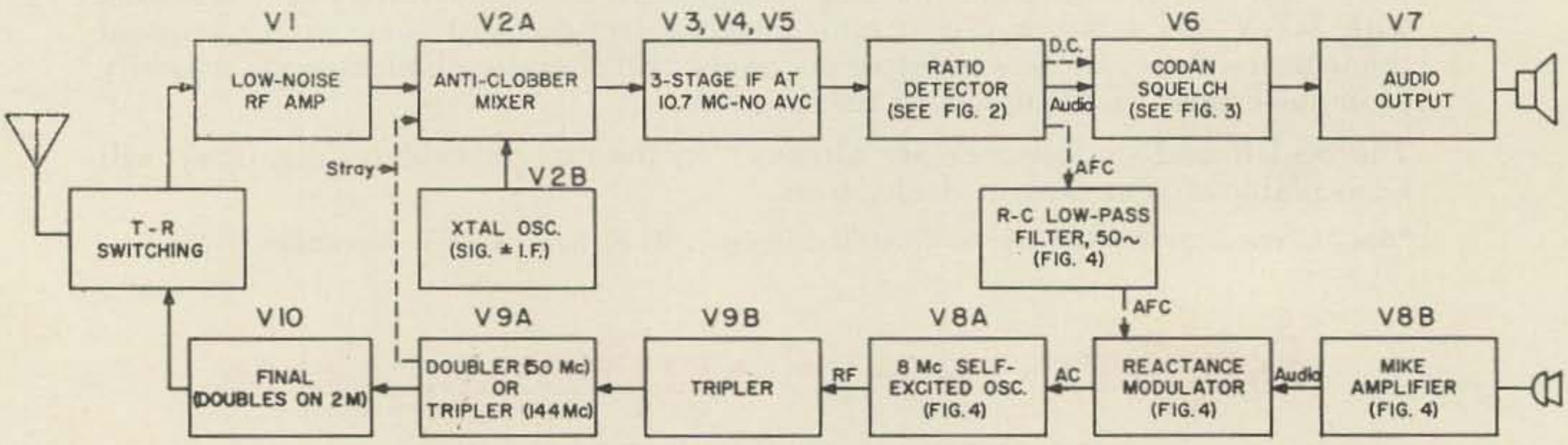
Please note, however, that the "low-noise rf amp" can be anything up to and including a paramp, while the "final" may similarly be anything up to and including a pair of 4CX-1000's. This transceiver is *not* limited to mobile or low-power use.

The unusual or unfamiliar circuits employed here are the Codan squelch, V6; the audio output, V7 (unfamiliar only in that a relatively new tube with great promise is used); the mike amplifier-self-excited oscillator, V8; the ratio detector; and the reactance modulator. Taking them in the order in which they appear in Fig. 1, let's examine the ratio detector first.

If you have been around TV or hi-fi servicing, you already know this circuit, but bear with us. It is built around two semiconductor diodes and a special transformer; the schematic appears in Fig. 2. Briefly, when the incoming signal is precisely in the center of the channel, both diodes produce dc output of exactly equal amplitude but opposite polarity. As the incoming signal goes to one side of center, output of one diode rises while that of the other falls off, giving an unbalanced output. When the signal goes the other way, the reverse happens.

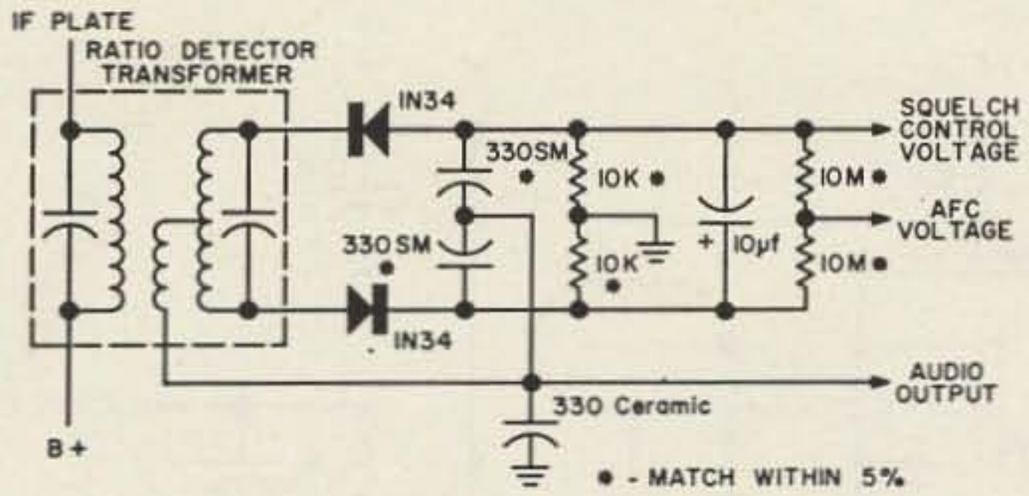
The electrolytic capacitor produces self-limiting, by preventing any audio voltage from appearing across the two load resistors in series at any time. The audio resulting from frequency modulation, however, shows up at the center-tap of the series capacitor string and moves on to the next stage.

A dc control voltage is taken off across the electrolytic for the squelch circuit, V6. This voltage is present only when a signal is being received. Another dc control voltage is taken off from the midpoint of a resistor string across the electrolytic; this point is at ground potential when the incoming signal is centered, goes positive when incoming signal is off-center in one direction, and goes negative when incoming signal is off in the other direction. It is filtered through an R-C low-pass filter with cutoff in the neighborhood of 50 cycles to remove any audio variations, and applied to the reactance modulator as afc (automatic frequency control) voltage.



CONVENTIONAL CIRCUITS: V1, V2, V3, V4, V5, V9 AND V10.

UNUSUAL OR UNFAMILIAR CIRCUITS: V6, V7, V8, RATIO DETECTOR AND REACTANCE MODULATOR.



RATIO DETECTOR SCHEMATIC
FIGURE 2

This afc provision allows the receiving oscillator crystal to control frequency stability of the transmitter as well. During transmission, the receiver oscillator, mixer, *if* strip, and detector are left in operation. They pick up enough output-frequency signal to put a strong signal through the *if* strip and into the detector. There, the afc produces a control voltage which keeps the transmitting oscillator tuned to the desired frequency despite any desire on the oscillator's part to drift haphazardly.

Squelch action is provided by V6. This tube consists of a triode-pentode hooked up as shown in Fig. 3. With no voltage on the pentode grid, this section conducts rather heavily and produces a large voltage drop across its plate load resistor.

However, this plate load resistor is also in the grid-cathode path of the triode section, which serves as first audio amplifier; the aforementioned voltage drop puts so much grid bias on the triode that it is cut off and no audio can get through.

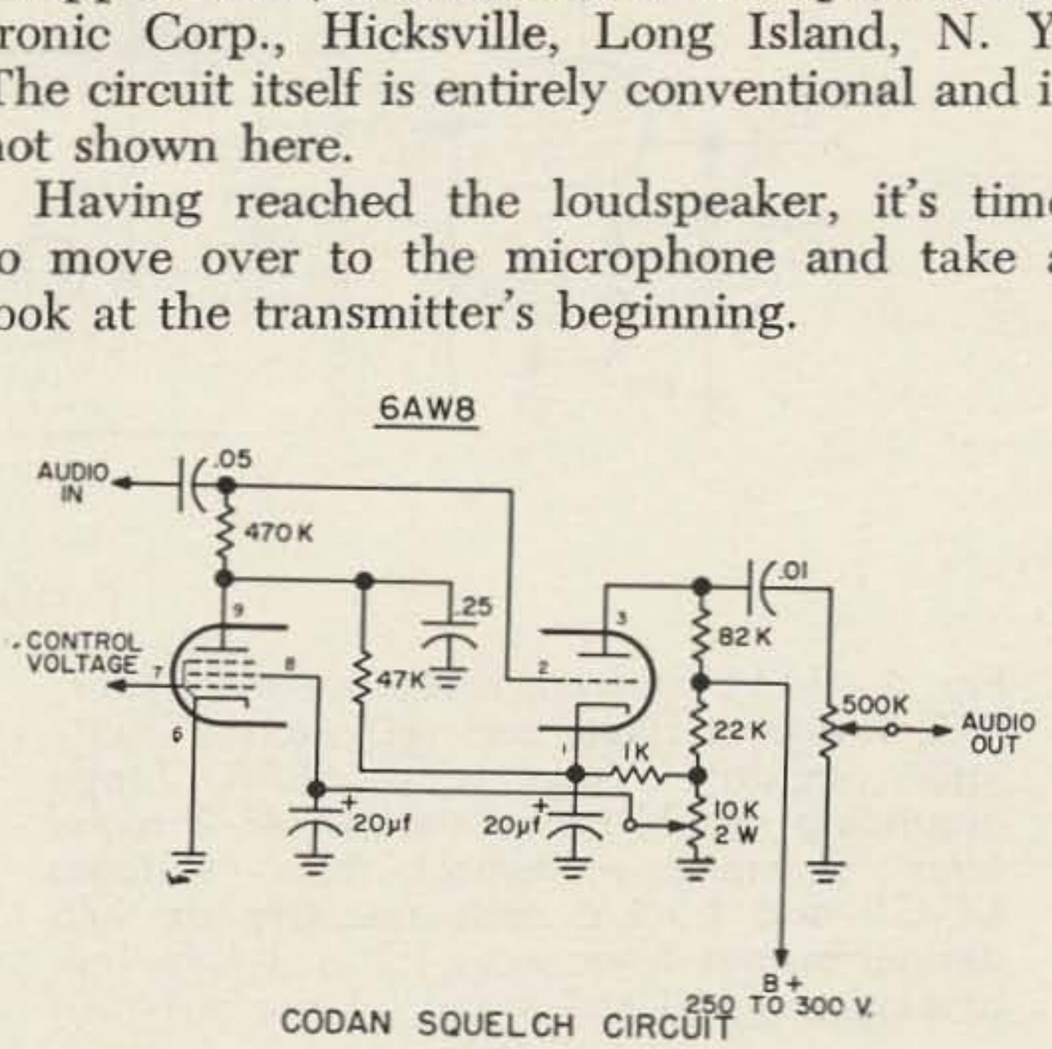
When sufficient negative voltage is placed on the pentode grid, this section cuts off and plate-current flow through the resistor ceases. The triode can now operate normally, passing audio signal.

If the dc for the grid of the pentode is obtained from a source which is dependent upon incoming signal, audio will pass only when a signal is being received. While waiting for a contact, nothing will get through to the speaker. The dc voltage furnished by the detector is of this nature.

Exact amount of voltage required for the conduction-to-cutoff transition is determined by the screen voltage applied to the pentode. Supplying this through a potentiometer provides a simple "squelch level" control.

Audio output from V6 goes to audio output tube V7, a type 6BQ5/EL84. Developed for TV use, this little 9-pin bottle delivers a full 4½ watts of power with only a few volts of driving signal. Since the ratio detector can be expected to provide from 1 to 5 volts of signal, and this is amplified from 10 to 30 times by the codan tube, you should have plenty of gain available! Full data on the tube, including typical operating conditions under a wide range of applications, is available from Amperex Electronic Corp., Hicksville, Long Island, N. Y. The circuit itself is entirely conventional and is not shown here.

Having reached the loudspeaker, it's time to move over to the microphone and take a look at the transmitter's beginning.



CODAN SQUELCH CIRCUIT
FIGURE 3

The mike amplifier, V8B, is a conventional audio amplifier using the pentode section of a type 6EA8 tube. It produces about 3 volts output from a ceramic mike, and about half that from an ordinary-quality dynamic. The only unusual part here is use of an Ohmite type J pot as a plate load resistor, to allow an output-level control with the minimum number of parts. The circuit is shown in Fig. 4, along with the reactance modulator and the self-excited oscillator.

The reactance modulator makes use of a voltage-variable capacitor, otherwise known as a silicon power rectifier, to achieve what is at the moment at least the utmost in simplicity for an FM modulator. The diode is reverse-biased by the large resistor running to the B-plus line; in this condition, its capacitance will change with any variation in voltage across it, and the change will be almost completely linear over a quite wide range. The *frequency* change (not capacitance) as a function of voltage change is linear to within 1 percent for a 40-percent change from original frequency. Thus, by simply applying a fraction of a volt of audio to this diode, which forms part of the frequency-determining tank of the oscillator, we can produce perfect FM.

The oscillator itself must not be designed for extreme stability, since anything which tends to increase stability makes it that much harder to get FM. On the other hand, all leads should be mechanically solid, etc., since the *only* FM we want is that coming from the microphone! The slug-tuned coil shown for the tank is rec-

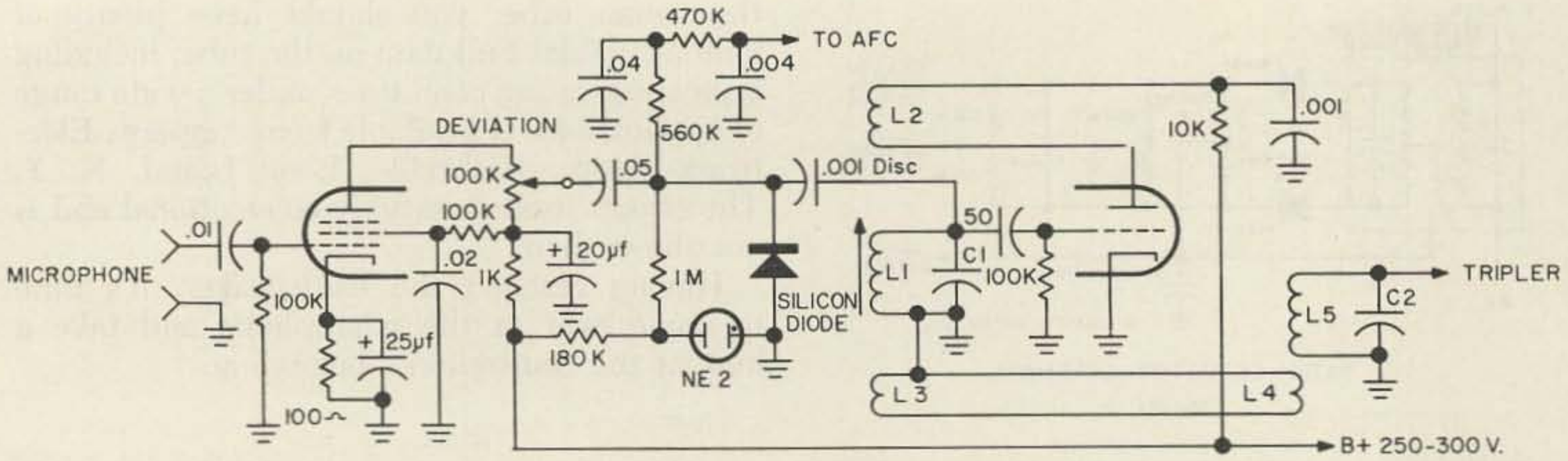


FIGURE 4

Fig. 4—Mike preamp, reactance modulator, AFC low-pass filter, and self-excited oscillator circuitry. Tube is a 6EA8. Stage grounding should be as shown. NE-2 regulates reactance-modulator bias voltage. L1-C1 and L5-C2 both resonate at 1/6 desired output frequency; L2 is 3-turn link at cold end of L1; L3 and L4 are one-turn links at cold ends of respective coils, connected by twisted-pair with single-point ground. 100K pot in pentode plate circuit controls frequency swing of modulator and should be set for maximum audio without breakup, using receiver known to have 15-kc discriminator bandpass.

ommended to allow easy initial tune-up.

Choice of the Armstrong oscillator was made on the basis of adaptability to commercially available coils; a Hartley or Colpitts is equally acceptable, providing only that you steer clear of the high-C circuits and make sure to include the coupling for the diode. Failure to make the diode part of the oscillator tank will mean failure to achieve the FM you are setting out to obtain.

From here on out to the antenna, follow standard VHF procedures. The only reason for including final-doubling to reach 144 mc was to maintain the tube complement at 10. If you don't mind another tube and want better output, add a doubler or a tripler and run the final straight through.

A few words about some of the other circuits and the way they are used: No avc is provided for the *if* strip in order to achieve a degree of limiting; it's almost impossible to overload an amplifier in FM, since class C provides the best limiting possible. Addition of 1000-ohm resistors in each *if* grid, between *if* transformer and grid, would help in this regard. The "T-R switching" indicated in Fig. 1 may be anything from a simple relay (probably the easiest) to a complex network of vacuum tubes (on 50 mc at least). In switching from transmit to receive, the cathode path of the receiving rf amplifier should be broken to prevent tube damage and the audio output should be disabled in some manner because the transmitter signal used for frequency control will also open the squelch. On receive, of course, all transmitting circuits should be dead.

For an exceptionally efficient mobile rig, you might consider using a transistorized crystal oscillator and mike preamp, and putting them in a tiny control head up front. The squelch control can also come up front since it carries only dc, and audio volume can be controlled with a pad across the speaker lines. Everything else can repose in the trunk. In this way, you can have instant frequency change and full control, without sacrificing legroom in the passenger compartment.

As we said at the beginning, this is an *idea* article rather than a blow-by-blow construction account. Make any changes or modifications you like. For example, the only reason for using 10.7 mc as the *if* is that ratio-detector transformers for this frequency are readily available. You can also use 4.5 mc, 1500 kc, or even 455 kc if you don't mind image-response troubles. These as well as any other modifications are strictly up to you.

Depending on whether your crystal frequency is above or below the signal frequency, you may find that the afc circuit refuses to hold in properly. This will be due to reverse polarity, so that the "correction" signal is actually increasing the error. The cure is to reverse polarity of the diodes in the ratio detector, also reversing the electrolytic capacitor at the same time. The squelch control voltage should always be taken from the *negative* end of the electrolytic.

So there you are. Dig out the back issues of 73, get some scratch paper, and let's see some more WBFM across the country!

. . . K5JKX

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WHY JOHNNY HAM

CAN'T HEAR

(with apologies to Rudolph Flesch)

Why is it you strain to hear a choice bit of DX everybody else is working and you can't hear even a beat note with the gain wide open? Or, you call and call a station and he works everybody but you? You're getting out—didn't you just work W2NSD/1 way up there in New Hampshire? Well, relax—there's a solution. Not a complete one, but it may answer some of your questions on frequency propagation.

As ridiculous as the old cliché sounds, you gotta hear 'em to work 'em. Yet, like an iceberg, there's much more below the surface than you see on top. The frequency propagations columns in amateur publications may say that the path to some DX area will be open on 14 mc. Great! But what these predictions mean—and they're just predictions—is that the maximum useable frequency (MUF) will be at, or above, 14 mc most of the days of the month. Some of the days it'll be below 14 mc. The MUF is a highly variable thing.

Let's talk a bit about the MUF then. It's directly related to the ionized layers that surround the earth. These layers—the D, E, and F layers—make high frequency communication possible beyond the line of sight. Their height and electrical composition reflect the rf wave back to earth at a distance. Most of you know, this distance is proportioned to the layer height, the angle at which the rf strikes the layer, and the layer's state of ionization. The ionization determines the highest frequencies to be returned to earth. In general, frequencies higher than the MUF are not returned and are limited to line of sight communication only.

Normally, a frequency known as the optimum traffic frequency (FOT) is chosen for the more permanent commercial circuits. The FOT is 15% below the MUF so variations in the MUF will not affect it greatly. The FOT should result in a solid circuit.

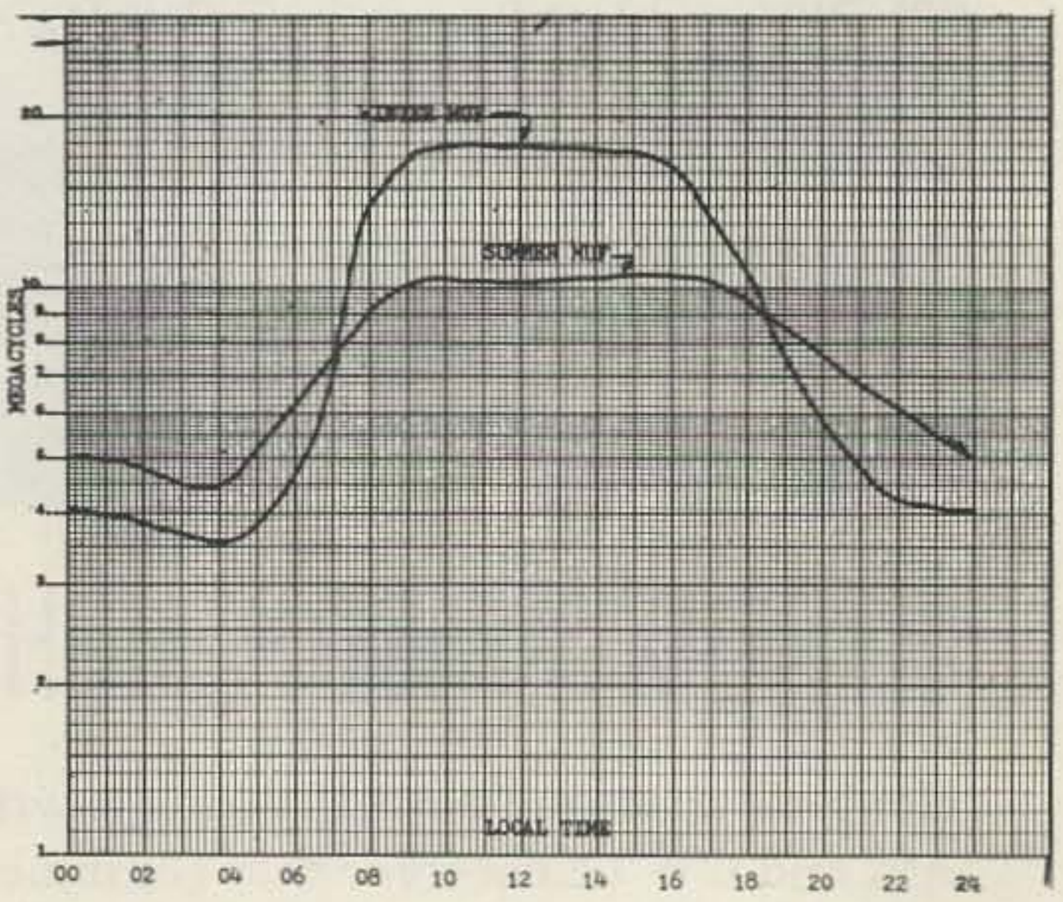

Fig. 1. Path length 1000 miles.

Since the layers are caused by the sun's radiation, you'd expect them to vary from month to month. That's exactly right. Fig. 1 shows typical summer and winter MUF's for a 1000 mile path. Several similarities are immediately apparent. First, the MUF's during the night hours do not differ greatly. Second, the dip just before dawn isn't really a dip. The MUF decreases sharply as the night passes, and the sudden sunrise raises it abruptly. The MUF rises until the ionized layers are saturated and can pass no higher frequency.

So—you're on this MUF (or FOT) trying to raise some DX and you can't make the grade! What's wrong? Well, it's possible that for your power and antenna you're not high enough in frequency! Now wait just a cotton-picking minute, you say—the F layer won't

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support a higher frequency over the path and yet I'm not high enough? Yes—for your power and antenna—you're not high enough!

There is a lowest useable frequency (LUF) associated with any communications path, no matter how long. The LUF has ruined your chances of working DX more times than once. That old cliché was a left-handed way of saying LUF. You must put a signal into the other guy's receiver before he can hear you.

The obvious question is "just how do I go about doing this." Well, it's not an easy question to answer. Putting in enough signal at the other end suggests a certain "required field strength" at the station. Stop and think a minute about how your signal gets there in the first place.

Obviously, it travels up the feedline and is radiated by the antenna. Their efficiencies are less than 100%, so you've lost power right away. Next, if your antenna has any gain, your signal will be concentrated in some form of beam. You haven't gotten any lost power back—you've just focused what's left. Then it travels up through the D and E layers to the F layer. The F layer reflects the signal back down through the D and E layers. Power is lost both on the way up and the way down. In reality, the D layer causes most of the losses.

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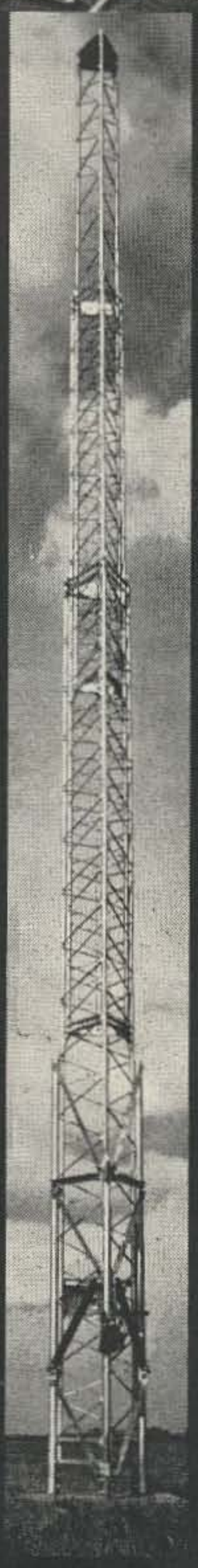
30 lbs./sq. feet	5 sq. feet
L.A. City Code (Strong Winds and Earthquakes)	10 sq. feet



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Bouncing off the earth, your signal is reflected up toward the layers again. This process keeps up as long as your signal is hopping across the miles to the DX. Though your signal started out at a hundred watts, when it arrives at the DX station it could be only microwatts!

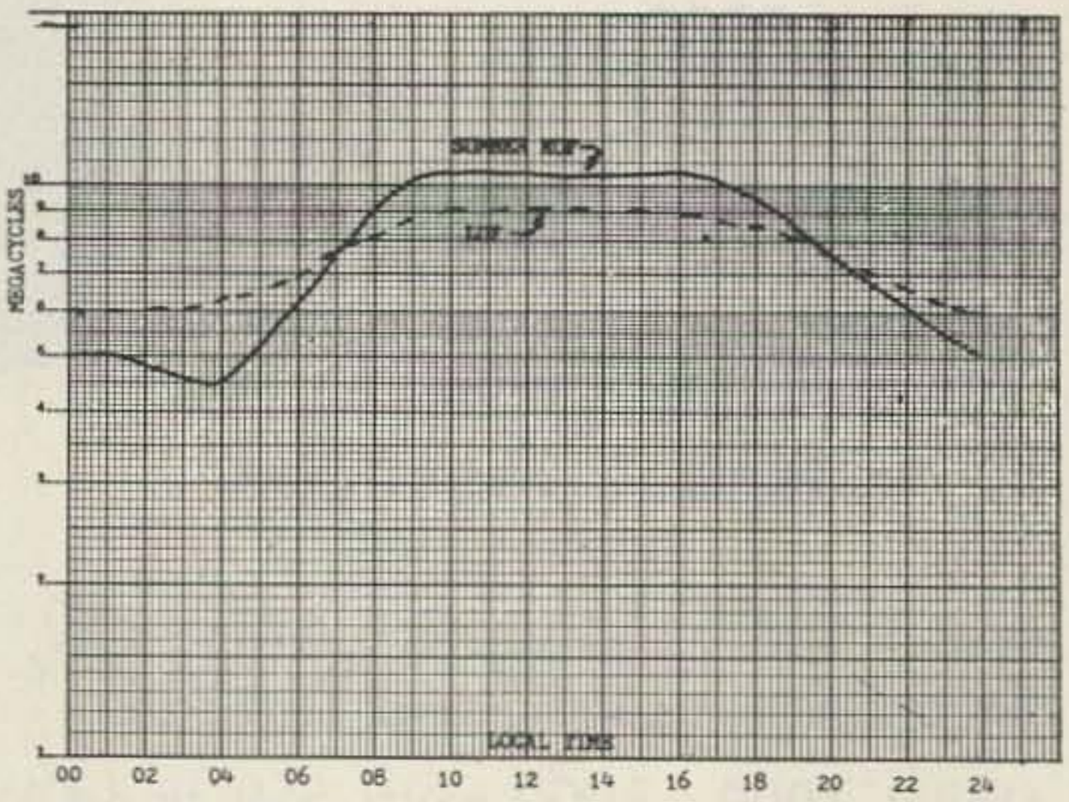


Fig. 2. Path length: 1000 miles; transmitter: 500 watts; noise level: 3; antennas: ½ wave dipoles, ½ wave high; mode: 15 WPM CW

Different types of emission—AM, CW, RTTY, and SSB—require different field intensities to be workable signals. For example, CW has a 17 db margin over AM. On CW you don't need sidebands, and the receiver selectivity can be made very high to eliminate most of th noise. AM fone must be at least 3 kc wide and the noise in the receiver will be much greater. The AM carrier serves no useful purpose as far as the information content is concerned and yet it uses up most of the power! No wonder the swing to SSB!

So, you've succeeded in putting in a microwatt signal at the DX station—can he hear you? Well, maybe yes and maybe no. What kind of an antenna and receiver does he have? What is his local noise level—is he in the tropics or the arctic? If he has a poor receiver and antenna plus being in the high noise regions of the tropics you probably won't be heard. The arctic auroral zones add to the attenuation of your signal so it may be only millimicrowatts—not enough to be workable.

Figs. 2 and 3 show typical LUF curves compared with the MUF's of Fig. 1. During the summer day hours, the particular path is marginal. Signals will be weak and fading. In the winter, the situation is much better. Communication is possible over most of the day on some frequency. You'll notice that the MUF has nothing to do with the LUF. The LUF is a calculated frequency based on the transmitter power, the two antennas used, the local noise level, the receiver, and any special absorption areas in the propagation path. It's

entirely possible for the LUF to exceed the MUF and no communication will be possible.

It's possible to get gross LUF calculations for a general DX area by making some simplifying assumptons. You assume only half-wave dipoles at each end, mediocre receivers, and a higher-than-expected noise level. Manuals which cover the subject more thoroughly are available for calculatiing LUF's.[1, 2]

Most hams wouldn't go through the tedious calculations required for LUF's, and you can't blame them. It takes about 6 to 8 hours for the whole process once you know what you're doing. It must be done on an individual basis—station by station. Not an inspiring way to spend your time and one of the reasons the magazines don't print them.

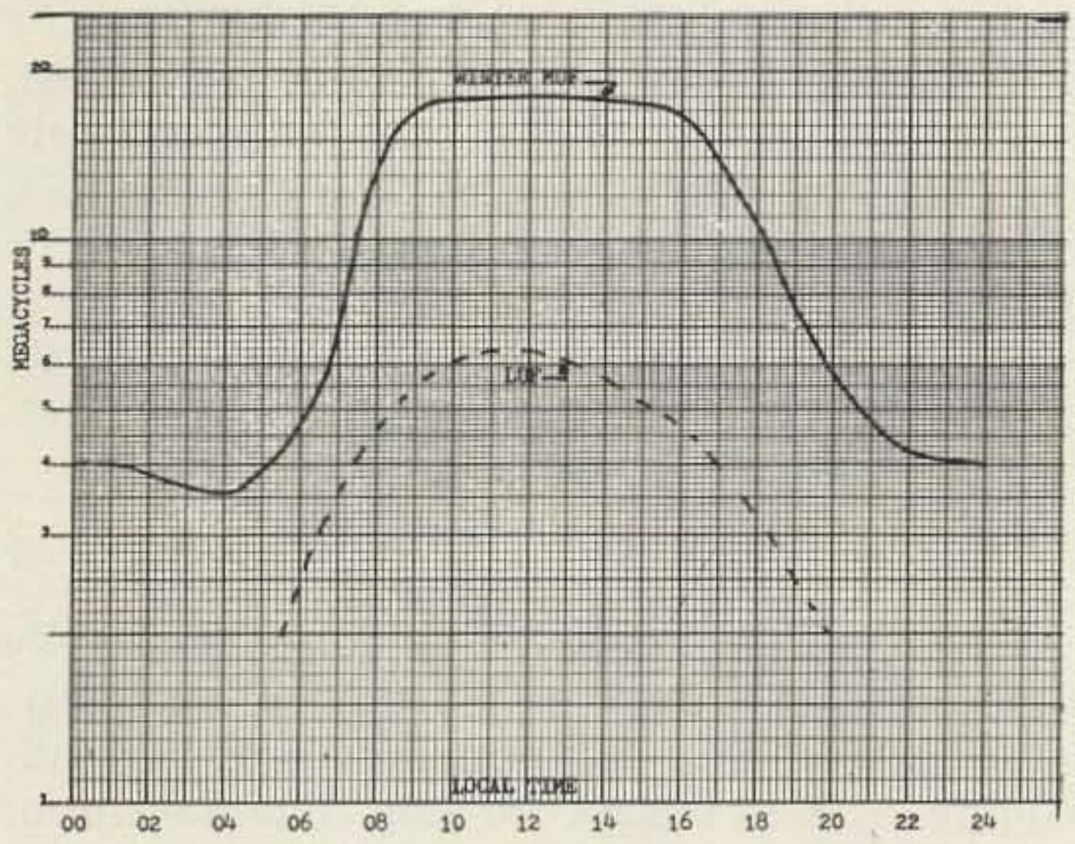


Fig. 3. Path length: 1000 miles; transmitter 500 watts; noise level: 3; antennas: ½ wave dipoles, ½ wave high; mode: 15 WPM CW

If calculations are not for you, the next best thing is an idea of what to do to avoid the LUF and its effects. This is simple in one sense—difficult in another. You can raise your power—use a California Kilowatt. Fine approach except it's illegal and it won't solve the problem. It's perfectly true higher power will push the LUF down. The problem is how much power? Doubling your power gives only a 3 db increase in field strength. Translated to frequency this may be only a few hundred kilocycles—hardly enough most of the time.

Even if you try to burn a hole through to the DX, just ask yourself this question—"how many DX stations have I worked that were running less than 100 watts?" Plenty I'll bet! That's because your antenna and receiver were doing a good job, and this is much closer to the real problem.

[1] Ionospheric Radio Propagation, Circular 462, National Bureau of Standards.
[2] Radio Frequency Propagation, TM-11-499, Department of the Army.
Both of these are available through the Superintendent of Documents, Washington, D. C.

You really need the best antenna you can get, the quietest location, and a good receiver. It's been said—a dime in the antenna is worth a dollar in the transmitter. How about *your* antenna? Did you use good insulators, solder all the connections and wrappings properly, or did you just twist the wires and let it go? You'd be surprised how much noise an unsoldered antenna joint can make in a gentle breeze.

Do you have the proper feedline for your antenna and is your transmitter and receiver SWR low? Yes, I said receiver. When you need every microwatt you can get to work DX, it seems silly not to match the receiver to the antenna. If you can possibly build a beam antenna for the frequency—do it!

When was the last time you aligned the receiver properly, or checked the tubes? Is everything on the nose for sensitivity and selectivity? Is there something you could do to improve the effectiveness of your receiver?

Like the weather, there's not much you can do about noise levels unless they're man-made. Many city power departments have interference bureaus which will check out your noise complaints free of charge. Faulty thermostats, leaky power line insulators, arcing neon transformers, and the like, all can cause heavy local interference. The unfortunate thing about these noise sources is that they may not be on during the working day of the interference bureau. Such was the unhappy situation at W6VAT a number of years ago. These nighttime noises can only be run down by effort on the ham's part, but it's always worth it.

Atmospheric and cosmic noises are the predominant sources of QRN in most locations. A low noise receiver isn't a help since atmospheric and cosmic noise below 30 mc is about 40 times greater than that generated in your receiver. A receiver noise figure of less than 10 or 12 db is not worth the effort.

Always operate as close to the MUF as possible. You won't need excessive power and your signals will have less losses in reaching the DX station. It is not always possible to be close to the MUF *and* have the desired DX station there too. Sometimes the DX is on a lower frequency and you must adjust accordingly. Here, the LUF will hurt you the most. The lower the frequency, the higher the noise level, the harder it is to build a good antenna. All the other variables plus operating skill must be in your favor. It will take effort, but when you have done your best, the LUF will be less of a problem—at least as far as you're concerned.

. . . W6VAT

Why Fight Ohm's Law?

Don Gunter K5HPT
Route #2, Box 304
Denham Springs, La.

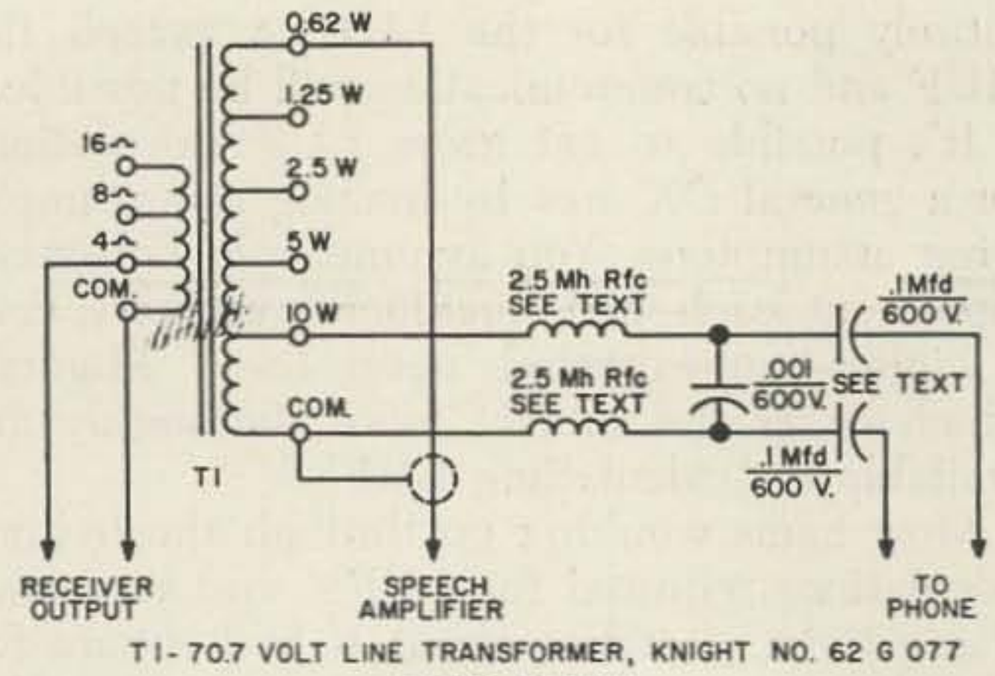
Ever wish you had a fone patch, but didn't know where to scrounge a transformer? well, if you don't happen to have one in your junk box, they're cheap, cheap.

First, let's review what a fone patch does. It's merely an impedance matching device, to match the 500 ohm telephone line to the low impedance output of your receiver, and to the high impedance input of your speech amp.

One of the things often forgotten in impedance matching is that a low impedance will work perfectly into a high impedance, provided you have sufficient output voltage. (Have you ever taped a broadcast by patching your high impedance tape recorder input to the receiver speaker leads?) We can't make any claims for efficiency or maximum power transfer, but we couldn't care less in this application.

With that out of the way, let's see what we can do about hooking up a fone patch.

At K5HPT, the receiver output is 4 or 8 ohms. We're using a high impedance (50K) dynamic mike into the speech amp. Searching through the catalogs for a cheap multi-tap transformer to match 500 ohms to 4 ohms and 50,000 ohms proved fruitless. Then we spied a tapped 70.7 volt line-to-voice-coil transformer. The specs read: Primary-4, 8, 16 ohms; Secondary watt taps-10, 5, 2.5, 1.25, 0.62.



T1 - 70.7 VOLT LINE TRANSFORMER, KNIGHT NO. 62 G 077
FONE PATCH
FIGURE 1

Whipping Ohm's law out of our hip pocket, we figured that $R = E^2/W$. Assuming a purely resistive load (good enough for this purpose), the impedance of any secondary tap is $Z = 70.7^2/W$ or:

10	watts =	500 ohms
5	=	1,000
2.5	=	2,000
1.25	=	4,000
0.62	=	8,000

Refer to Fig. 1, and we've got it made. We can match the receiver to the line perfectly, and the 0.62 watt tap provides more than adequate drive to the speech amp. The transformer cost only $2.41, and is available from Allied Radio Corporation, Chicago, Illinois.

The filter consisting of C1 and the two rf chokes may be unnecessary. It's used at K5HPT because rf pickup in the telephone line outside the shack caused a feedback problem.

One word of caution. Don't skimp on the two 0.1 mfd 600 volt condensers. They block dc from the transformer, and, more important, prevent placing a load on the telephone line.

Now get busy and enjoy the thrill of patching in two old friends and letting them chat over your rig—it's worth it.

. . .K5HPT

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an announcement of significance to all amateur radio operators

The Heath Company takes pleasure in introducing on the following pages, the first of a complete series of fully integrated SSB amateur radio equipment that will set new standards for value, quality, style, and performance. To be designated the Heathkit SB Series, these products represent a major step forward in amateur radio SSB equipment. Now, the best in SSB design features are combined with Heathkit's leadership in electronic kit techniques to bring maximum performance and operating convenience to amateurs at modest prices.

What design features are essential or desirable for the best SSB performance? Some of the more important ones are high mechanical and electrical frequency stability achieved only by employing crystal-controlled heterodyne circuitry with low frequency variable frequency oscillators, optimum receiver selectivity and minimum transmitted signal bandwidth obtainable by means of the excellent shape factors exhibited only by crystal or mechanical filters, linear tuning with 1 kc dial calibration, smooth anti-backlash dial, automatic level control, small size, and light weight. The SB Series has all these plus the several improved and unique features listed below.

To provide even better performance plus maximum ease of assembly, these new Heathkit SSB products also feature linear dials providing 500 kc frequency coverage per bandswitch position while maintaining 1 kc calibration marks spaced approximately ⅛" apart, a high frequency bandpass IF (8.4—8.9 mc) for improved image rejection and suppression of spurious responses, preassembled and prealigned LMO (linear master oscillator), circuit boards and wiring harnesses, plus specially tooled cabinet, knobs, dial mechanism, and LMO components. When the transmitter and receiver are operated in the transceive mode, in addition to the usual practice of employing a common VFO and high frequency oscillator, the receiver BFO is used as the transmitter carrier oscillator to prevent even minute frequency changes between transmit and receive due to crystal tolerances. This attention to detail is typical of the careful, thorough engineering behind the Heath SB Series.

Only Heathkit experience and know-how can provide the engineering and manual skills necessary to bring such quality and performance to kit-form SSB equipment. Despite this background, Heath engineers spent over two years in the design of the equipment, and the developing and specifying of the critical components (such as the LMO, crystal filters, and dial mechanism). Only the most capable manufacturers have been selected to supply the special components and, as always, only the highest quality parts are employed throughout.

Carefully read the features and specifications of the SB-300 SSB Receiver described on the next two pages. The entire SB Series will exhibit all these fine performance characteristics using the same basic critical components in equipment covering all amateur interests.

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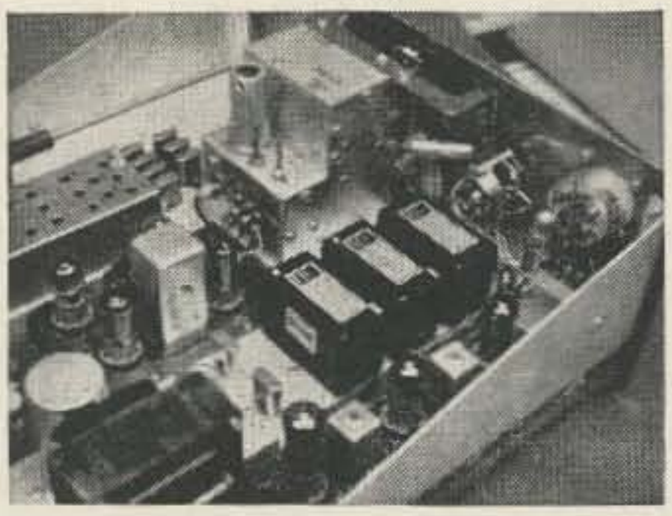
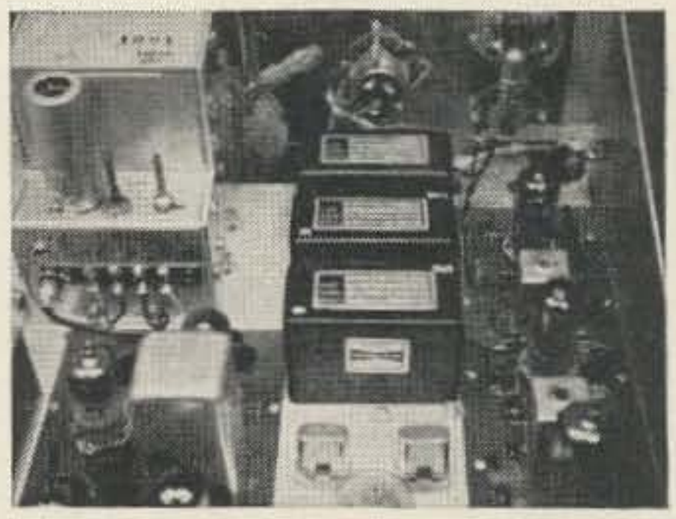
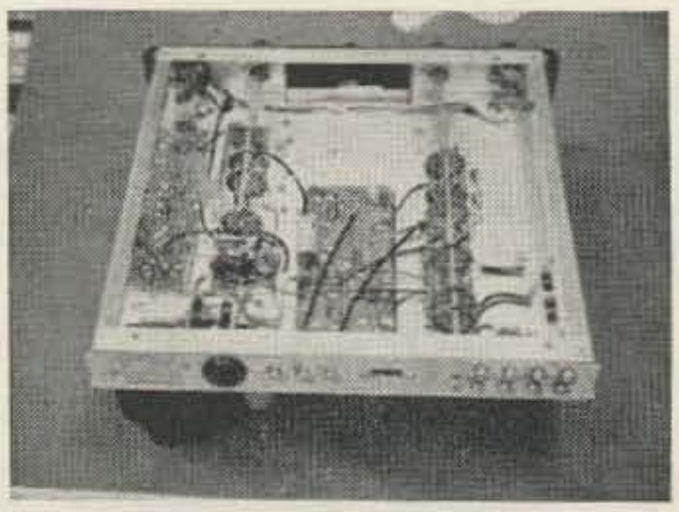


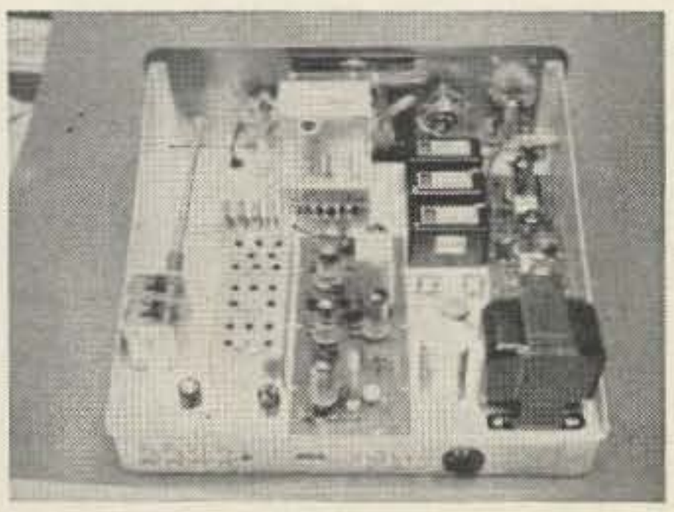
Precision-built Linear Master Oscillator (LMO) is completely assembled and calibrated, ready to install; specially designed dial assures accurate readout and smooth frequency control.



Prebuilt, hermetically-sealed 2.1 kc crystal band-pass filter for SSB provides the excellent nominal shape-factor of 2:1 (60/6 db). Optional AM and CW filters shown installed.



Two heavy-duty 3/32" circuit boards and pre-cut, cabled wiring harness maintain a clean, uncluttered layout for fast, easy assembly, years of faithful performance.



All adjustments are conveniently made from the top of the chassis; chassis screening clearly identifies coil and tube locations, etc. Entire top of ventilated cabinet opens for easy access.

SB-300 features

- Complete coverage of 80 through 10 meter amateur bands with all crystals furnished, plus provision for VHF converters
- Crystal-controlled front-end for same tuning rate on all bands
- 1 kc dial calibrations — 100 kc per dial revolution provides band spread equal to 10 feet per megacycle — tuning knob to dial ratio approx. 4:1
- Provision for transceive operation with matching SB-400 Transmitter (available soon)
- Prebuilt linear master oscillator (LMO), wiring harness and two heavy-duty circuit boards for fast, easy assembly
- Professional styling and features throughout for finest HF and VHF amateur band communications

Experienced amateurs will especially appreciate the careful attention to detail behind the design of the SB-300. Its many features include a crystal controlled front-end that provides the same tuning rate on all bands, a prebuilt Linear Master Oscillator (LMO) for linear tuning with 1 kc dial calibrations, built-in crystal calibrator and 2.1 kc crystal-lattice bandpass filter, a smooth, non-backlash vernier dial drive mechanism, and a beautifully styled cabinet and panel. Cabinet top opens completely for easy access to top chassis components. Optional AM and CW filters are low-cost and easily installed, their steep-sided bandpass eliminates, not merely attenuates, adjacent interfering signals for exceptional reception.

Circuit features include a high frequency I.F. for maximum I.F. and image rejection, audio inverse feedback, fast-slow-off AGC control, stability of 100 cps after warmup, and a host of other deluxe features that assure finest communications results. Order your SB-300 now for 60% savings over comparable factory-built receivers! A matching Transmitter, 1 KW Linear Amplifier, and an All-Band SSB Transceiver will be available soon!

Kit SB-300....17 lbs.....no money dn., $25 mo..... **$264.95**
SBA-300-1 CW Crystal Filter (400 cps)....1 lb..... **$ 19.95**
SBA-300-2 AM Crystal Filter (3.75 kc)....1 lb..... **$ 19.95**

Check the superb specifications below and see what a tremendous dollar value the SB-300 represents!

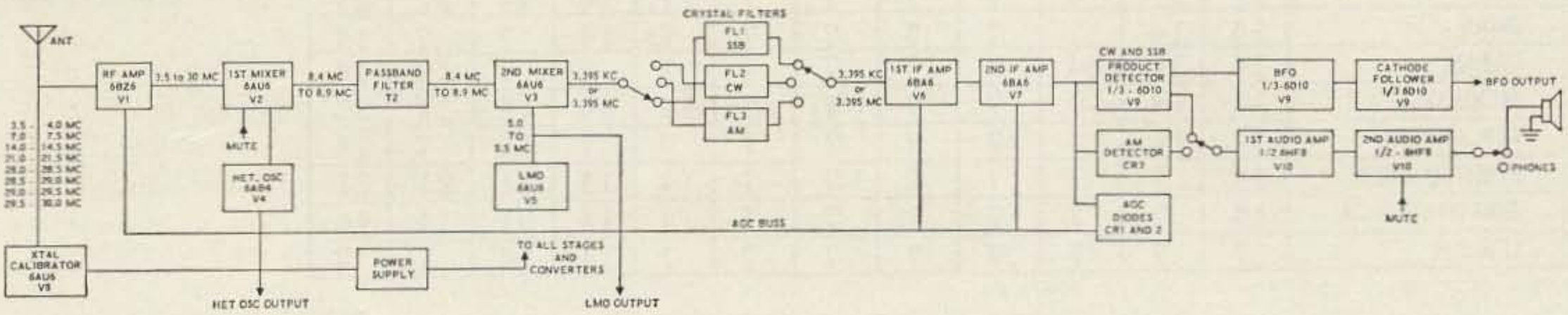
Frequency Range (megacycles): 3.5 to 4.0, 7.0 to 7.5, 14.0 to 14.5, 21.0 to 21.5, 28.0 to 8.25, 28.5 to 29.0, 29.0 to 29.5, 29.5 to 30. **Intermediate frequency:** 3.395 megacycles. **Frequency stability:** 100 cps after warmup. **Visual dial accuracy:** Within 200 cps on all bands. **Electrical dial accuracy:** Within 400 cps on all bands. **Backlash:** No more than 50 cps. **Sensitivity:** Less than 1 microvolt for 15 db signal plus noise-to-noise ratio for SSB operation. **Modes of operation:** Switch selected: LSB, USB, CW, AM. **Selectivity:** SSB: 2.1 kc at 6 db down, 5.0 kc at 60 db down (crystal filter supplied). AM: 3.75 kc at 6 db down, 10 kc at 60 db down (crystal filter available as accessory). CW: 400 cps at 6 db down, 2.5 kc at 60 db down (crystal filter available as accessory). **Spurious response:** Image and IF rejection better than 50 db. Internal spurious signals below equivalent antenna input of 1 microvolt. **Audio response:** SSB: 350 to 2450 cps nominal at 6 db. AM: 200 to 3500 cps nominal at 6 db. CW: 800 to 1200 cps nominal at 6 db. **Antenna input impedance:** 50 ohms nominal. **Muting:** Open external ground at Mute socket. **Crystal calibrator:** 100 kc crystal. **Front panel controls:** Main tuning dial; function switch; mode switch; AGC switch; band switch; AF gain control; RF gain control; preselector; phone jack. **Rear apron connections:** Accessory power plug; HF antenna; VHF #1 antenna; VHF #2 antenna; mute; spare; anti-trip; 500 ohm; 8 ohm speaker; line cord socket; heterodyne oscillator output; LMO output; BFO output; VHF converter switch. **Tube complement:** (1) 6BZ6 RF amplifier; (1) 6AU6 First mixer; (1) 6AB4 Heterodyne oscillator; (1) 6AU6 LM osc.; (1) 6AU6 second mixer; (2) 6BA6 IF amplifier; (1) 6AU6 Crystal calibrator; (1) 6HF8 1st audio, audio output; (1) 6AS11 Product detector, BFO, BFO amplifier. **Power supply:** Transformer operated with silicon diode rectifiers. **Power requirements:** 120 volts AC, 50/60 cps, 50 watts. **Dimensions:** 14-7/8" W x 6-5/8" H x 13-3/8" D.

WATCH FOR THESE NEW HEATHKIT RELEASES!

SB-100 ALL-BAND SSB TRANSCEIVER

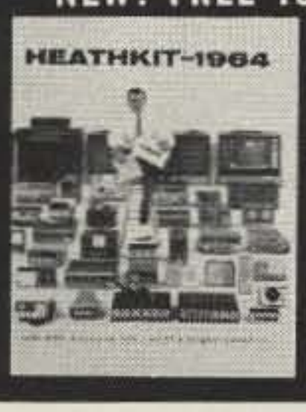
SB-200 1 KW LINEAR AMPLIFIER

SB-400 SSB TRANSMITTER



HEATHKIT® by Daystrom

NEW! FREE 1964 HEATHKIT CATALOG



See the latest new products in Heathkit's wide, wonderful line. Over 250 do-it-yourself kits for stereo/hi-fi, marine, TV, electronic organ, amateur radio, test instruments, educational, home and hobby that will save you up to 50%. Send for your free copy today!

HEATH COMPANY, Benton Harbor 11, Michigan 49023

☐ Please send FREE copy of New 1964 Catalog
☐ Please send SB-300 Specification Sheet
☐ Enclosed is $_____, please send Model _____

Name_____

Address_____

City_____ State_____ Zip Code_____

Propagation Charts

The monthly frequency predictions for this page are made, in accordance to fixed rules, from Basic Data compiled by the Bureau of Standards. The technique is quite complex. There are six parameters, four of which are known precisely, and two variables. The four known are distance, direction, time of day, and month of year. The two variables are sunspot numbers and height of ionosphere. These last two can be used only as averages and cause the day-to-day variations in frequency behaviour.

This month 28 MC (10 meter band) is indicated as workable for a few hours on some circuits. On good days it's worth a try. If it doesn't work, drop to 21 MC. Likewise, 21 MC shows up on some circuits for a few hours. If it doesn't work, drop to 14 MC.

J. H. Nelson

EASTERN UNITED STATES TO:

GMT-	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	7	7	7	7	7	7	7	7	14	14	14	14
ARGENTINA	14	14	14	7	7	7	14	21	21	21	28	21
AUSTRALIA	14	7	7	7	7	7	7	14	14	14	21	21
CANAL ZONE	14	7	7	7	7	7	14	21	21	21	28	21
ENGLAND	7	7	7	7	7	7	14	21	21	14	14	7
HAWAII	14	14	7	7	7	7	7	7	14	14	21	21
INDIA	7	7	7	7	7	7	14	14	14	14	7	7
JAPAN	14	7	7	7	7	7	7	7	7	7	7	14
MEXICO	14	7	7	7	7	7	7	14	14	21	21	21
PHILIPPINES	7	7	7	7	7	7	7	14	14	7	7	14
PUERTO RICO	7	7	7	7	7	7	14	14	14	21	21	14
SOUTH AFRICA	7	7	7	7	7	14	14	21	21	21	21	14
U.S.S.R.	7	7	7	7	7	7	14	14	14	14	7	7

CENTRAL UNITED STATES TO:

GMT-	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	7	7	7	7	7	7	7	14	14	14	14
ARGENTINA	14	7	7	7	7	7	14	21	21	21	28	28
AUSTRALIA	21	14	7	7	7	7	7	7	14	14	21	21
CANAL ZONE	14	7	7	7	7	7	14	21	21	21	28	28
ENGLAND	7	7	7	7	7	7	7	14	14	14	14	7
HAWAII	14	14	7	7	7	7	7	7	14	14	21	21
INDIA	7	7	7	7	7	7	7	14	14	7	7	7
JAPAN	14	14	7	7	7	7	7	7	7	7	14	14
MEXICO	7	7	7	7	7	7	7	14	14	14	21	14
PHILIPPINES	14	14	7	7	7	7	7	7	14	7	7	14
PUERTO RICO	14	7	7	7	7	7	14	21	21	21	21	21
SOUTH AFRICA	14	7	7	7	7	7	14	14	14	21	21	14
U.S.S.R.	7	7	7	7	7	7	7	14	14	7	7	7

WESTERN UNITED STATES TO:

GMT-	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7	7	7	7	7	7	7	14	14	14
ARGENTINA	21	14	7	7	7	7	7	14	21	21	21	28
AUSTRALIA	21	21	14	7	7	7	7	7	14	14	21	21
CANAL ZONE	21	14	7	7	7	7	7	14	21	21	21	21
ENGLAND	7	7	7	7	7	7	7	14	14	14	7	7
HAWAII	21	21	14	7	7	7	7	7	14	14	21	21
INDIA	14	14	7	7	7	7	7	7	14	7	7	14
JAPAN	14	14	14	7	7	7	7	7	7	7	14	14
MEXICO	14	14	7	7	7	7	7	14	14	14	14	21
PHILIPPINES	14	14	14	7	7	7	7	7	7	14	7	14
PUERTO RICO	14	7	7	7	7	7	7	14	14	21	21	21
SOUTH AFRICA	14	7	7	7	7	7	7	14	14	21	14	14
U.S.S.R.	7	7	7	7	7	7	7	7	14	14	7	7

Es means the possibility of a high MUF and/or freak conditions.

PROPAGATION FORECAST

DATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
GOOD	■	■	■	■			■	■	■	■	■	■	■	■	■	■			■	■	■				■					
FAIR		■	■		■	■		■	■					■	■		■	■				■	■	■		■	■	■	■	■
BAD	■			■	■	■	■			■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Es	■	■	■					■	■	■	■	■	■	■	■	■	■				■	■	■	■	■	■	■	■	■	■

■ = INDICATES PREVALENT CONDITIONS

New Products

Lafayette Catalog

Lafayette has just brought out their 1964 catalog. Though this is rushing the season a bit, the catalog is a corker. Not only does Lafayette carry a gigantic supply of parts, but they have a big line of ham gear. Drop a card to Lafayette Electronics, Syosset, New York.

HX-50 Accessory

Hammarlund has announced a little gadget for their HX-50 sideband transmitter which permits you to zero beat by means of an external switch (like a foot switch). Kit form is $12.50, wired $20. Write Hammarlund, 53 West 23rd Street, New York 10.

BANDIT 2000A

LINEAR AMPLIFIER

Amateur Net $575.00

Grounded grid operation, 2000 watts PEP, 160 watts PEP drive required. 80-40-20-15-10 meters. Relay operated by exciter. Compact self contained solid state power supply. Size: 14¾" x 6¾" x 14". 45 lbs.

Hunter Manufacturing Company, Inc.

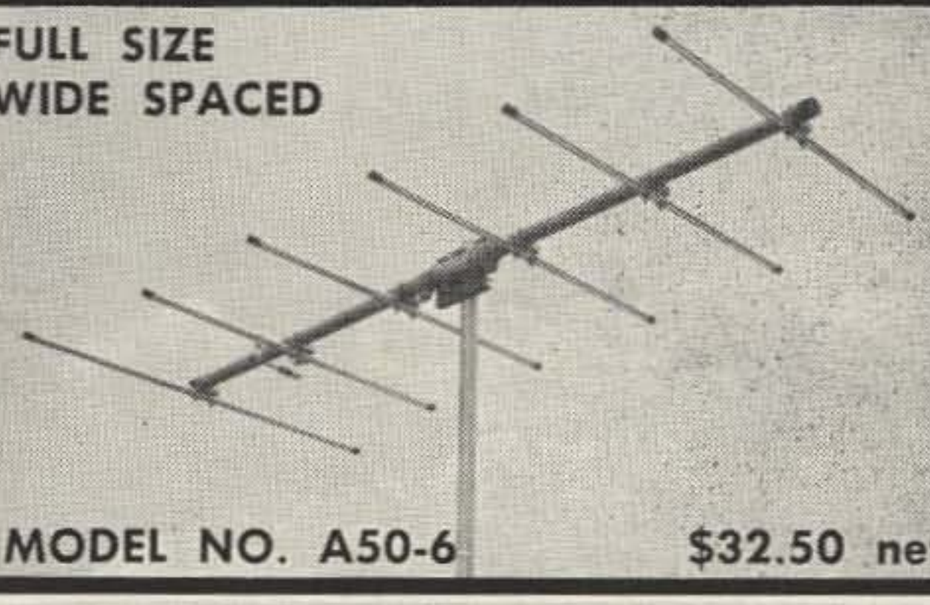
IOWA CITY, IOWA

6 FOR 6

ELEMENTS METERS

Another outstanding 6 meter beam by Cush Craft. Elements are full size ¾" .058 wall aluminum tubing. Boom is 20' x 1½" .058 wall aluminum tubing. Mast support is 6" x 6" formed aluminum plate with 2" ubolts. All parts are marked for quick, neat assembly, without special tools. Weighs only 17 lbs. Preassembled "Reddi Match" provides direct 52 ohm feed, and 1 to 1 SWR. FORWARD GAIN 11.2 db FRONT TO BACK RATIO 20 db. Buy CUSH CRAFT for more Solid Value and Performance.

FULL SIZE
WIDE SPACED



MODEL NO. A50-6 $32.50 net

THE BIG WHEEL

Horizontally polarized, omnidirectional gain antenna features low-Q, large capture area, ease of matching and improved band width. 2 and 4 stack models available.

Model ABW-420—1 bay, ¾ meter	$8.95
Model ABW-220—1 bay, 1¼ meter	10.95
Model ABW-144—1 bay, 2 meter	12.95

VHF BEAMS

Rugged, lightweight, and real performers. Booms, 1" diameter aluminum tubing elements 3/16" diameter aluminum rod preassembled on booms. Transformer dipole or Reddi Match. Dual and Quad Arrays available.

Model A144-11—11 element, 2 meter, boom 12'	$12.75
Model A144- 7— 7 element, 2 meter, boom 8'	8.85
Model A220-11—11 element, 1¼ meter, boom 8.5'	9.95
Model A430-11—11 element, ¾ meter, boom 5'	7.75

6 METER BEAMS

Full size, wide spaced, booms 1¼" and 1½" diameter, elements ¾" diameter aluminum tubing. Reddi Match for direct 52 ohm feed 1:1 SWR.

Model A50-3—5 element, 6 meter, boom 6'	$13.95
Model A50-5—5 element, 6 meter, boom 12'	$19.60
Model A50-6—6 element, 6 meter, boom 20'	32.50
Model A50-10—10 element, 6 meter, boom 24'	49.50
Model A50-3P—Portable 3 element, 50" x 4" folded	10.95

VHF MOBILE HALOS

Aluminum construction; machined hardware; Reddi Match for 52 or 72 ohm direct feed. 2 meter. Dual halo two bands one 52 ohm feed line.

Model AM-2M—2 meter, with mast.	$8.70
Model AM-22—2 meter, stacked Complete	14.95
Model AM-6M—6 meter, with mast.	12.50
Model AM-26—6 and 2 dual halo, with mast	17.45

VHF COLINEAR ARRAYS

Lightweight mechanically balanced VHF antenna systems. Extremly high power gain, major front lobe, low SWR, and broad band coverage; low angle of radiation and large capture area. 32 and 64 element arrays available.

Model CL-116—2 meter, 16 element colinear.	$16.00
Model CL-216—1¼ meter, 16 element colinear.	12.85
Model CL-416—¾ meter, 16 element colinear.	9.85
Model CL-MS—Universal matching stub matches 300 ohm 16 element antennas to 200, 52, or 72 ohm feed lines.	4.75

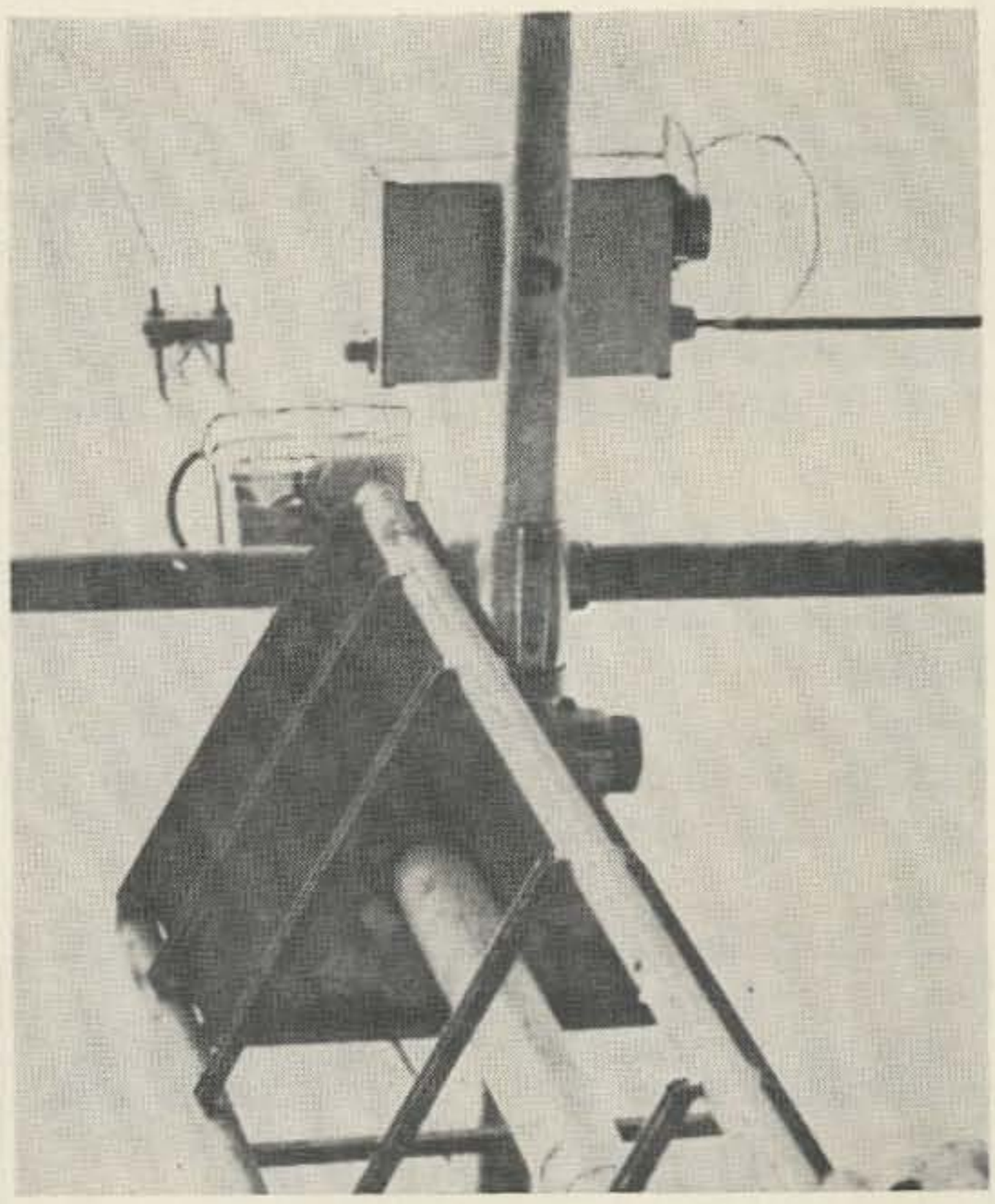
See your distributor or write for Free Catalog

Cush Craft

621 HAYWARD ST. MANCHESTER N. H.

THREE ELEMENT REMOTELY TUNED YAGI

Ronald Lumachi WB2CQM
73 Bay 26th Street
Brooklyn 14, New York



An aerial view of the beam and gamma section in its operating position.

Many novice amateurs, after digesting the first thrills of radio operation begin to search out the elusive DX QSO, but the inadequacy of standard equipment (dipoles, long wires, etc.) does not provide this satisfaction. Their radiation characteristics preclude a concentrated and directed rf pattern. To answer the needs of the radio operator, I have designed an easily assembled, remotely tuned, light weight, yagi-type array that will answer the DX problems of the many amateur radio enthusiasts.

The Gamma

We are all aware of changing antenna characteristics with respect to ground potential, however, few will brave the operating heights of their antenna supporting structures to make the critical beam adjustments necessary for maximum transferral of radio frequency power. This somewhat dangerous task has been partially eliminated by the insertion of a remotely tuned gamma matching arrangement which can be permanently affixed to the antenna boom.

The unit proper is mounted in a 3x5x7 inch minibox, and driven by a 1 rpm motor. A wide-spaced variable condensor coupled to this unit provides the necessary capacitance to tune out any reactance. The capacitance is placed in series with the center conductor of the co-ax line and fed through a porcelain in-

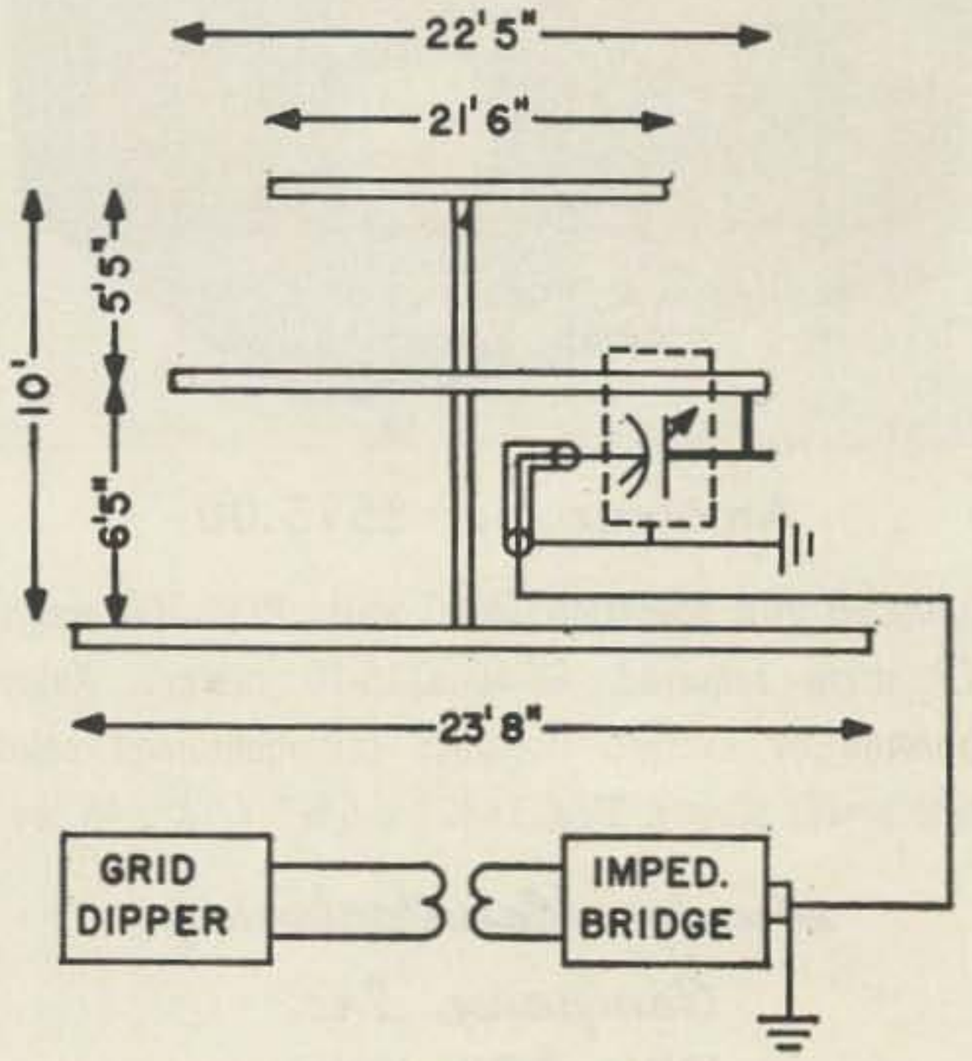
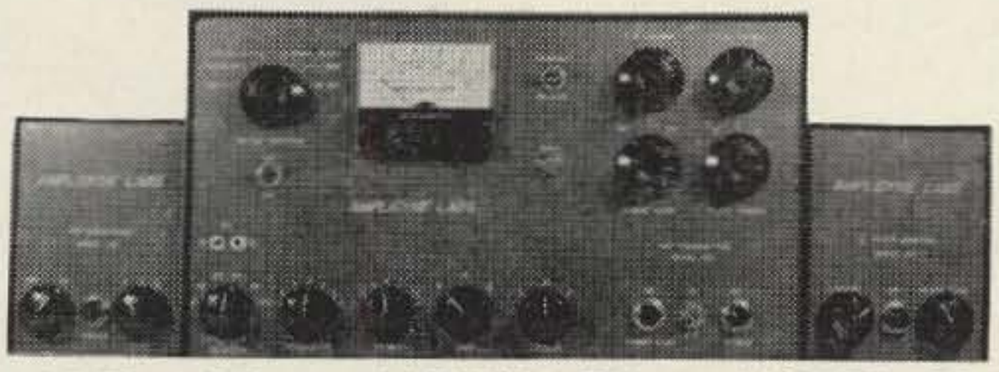


FIG. 1

ANNOUNCING



MODEL 126 MODEL 621 MODEL 221

MODEL 126
Another first from Amplidyne! A VHF three band crystal controlled nuvistor converter. It features a built in power supply, 3 Db noise figure on 6 & 2, 4 Db on 220 Mc., 30 Db gain, two 6CW4 grounded grid overload proof Nuvistor I. F. amplifier for perfect match to the receiver. This unit available with either 7-11, 14-18, 26-30, or 30.5-34.5 Mc. I.F. output. Priced at $94.50. The size is identical with the Model 221 and is a matching companion.

MODEL 621
At long last, a new VHF transmitter that incorporates all these long needed features: 60 watts input on 6 AND 2; high level plate modulation; full metering of all circuits, including RF output; VFO and antenna relay controls built in; built in dummy load; four internal crystal sockets and one socket located on the front panel for easy access. This unit utilizes a high efficiency final, the 8150 compactron, which is designed for full rated operation to 175 Mc. The dimensions are 14" wide, 8" high, and 10" deep. Priced at $229.50 our plant or through your local distributor.

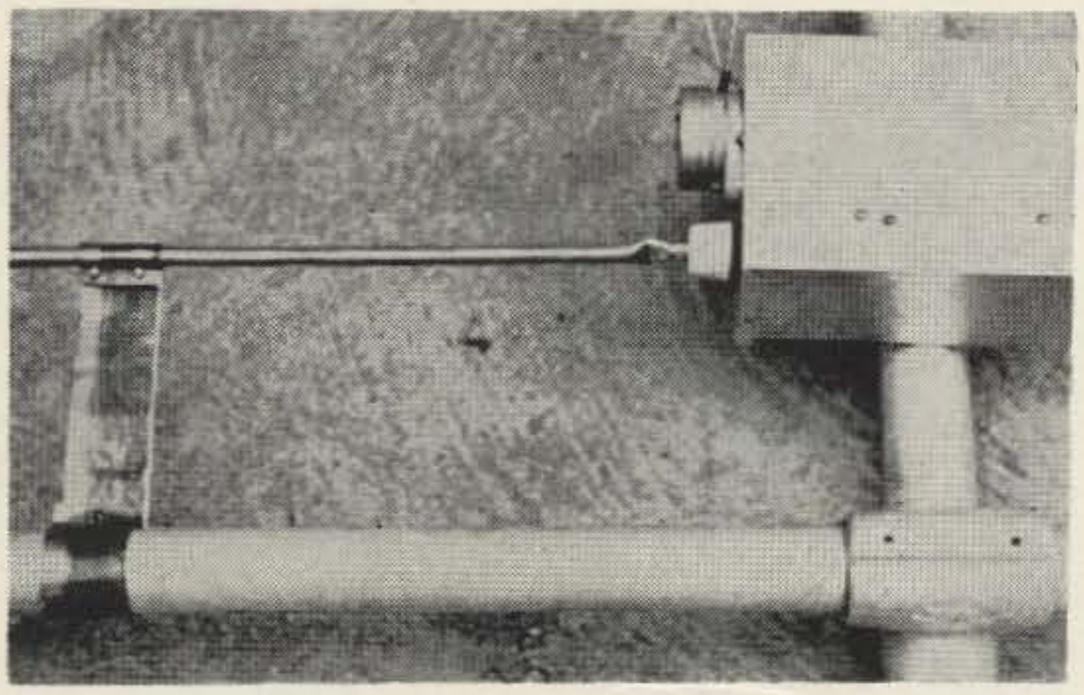
MODEL 221
A 220 M. adapter that is used with the Model 621 transmitter or any unit which will supply modulation, power, and 55 Mc. RF. Input power is 18 watts CW or 15 watts on AM. The dimensions are 4" wide, 5½" high, and 10" deep. All AMPLIDYNE LABORATORIES products have white silk-screened lettering on a green faceplate and black cabinets. Price $72.50 FOB Kings Park, N. Y.

BOX 673

AMPLIDYNE LABS
KINGS PARK LI NY

The standard Amplidyne guarantee of one year on tubes, two years on parts applies to all the above. Order direct from our plant or see your local distributor.

Write for your copy of THE AMPLIDYNE VHF LINE. Distributor inquiries invited.



The gamma rod, minibox container, motor, feed-thru insulator and aluminum cross.

sulator to the standard gamma matching rod. This particular type system was chosen since its unbalanced characteristics are particularly well suited to the coax type coupling arrangement. The shield of the 50 ohm cable is grounded to the minibox via the SO239 connector which is affixed to the minibox. This is in turn mounted to the exact center of the middle (driven) element. Needless to say, the series capacitor must be insulated from ground through poly-styrene or other low loss material, and should have sufficient plate to stator spacing to provide a margin of safety for ones

HARMONIC/TVI PROBLEMS???

6 METERS

TUNABLE LOW-PASS MAVERICK
The only low-pass filter designed expressly for 6 meters. With 9 individually shielded sections and 5 stages tunable forming a composit filter of unequaled performance. 1 DB loss. Handles 400 watts PI. 35 DB rejection. Size 5" by 2" by 3". *AMATEUR NET $16.95*

MAVERICK II WITH POWER MONITOR
Same as above but with 6 meter power indicator calibrated in watts output. Indicator Size 4" by 4" by 4½". Slant Face. Reads 0-50. 0-400 watts.
AMATEUR NET $34.95

2 METERS

BAND-PASS MODEL BP-144
A narrow band-pass filter with 6 mc pass band and 146 mc center frequency. 1 DB insertion loss. 35 DB attenuation of harmonics. Handles up to 185 watts PI. Size 4" by 2¼" by 2¼". *AMATEUR NET $11.85*

Write for complete brochures. See your local dealer.
Manufacturers of the finest UHF TV Converter

GAVIN INSTRUMENTS, INC.
DEPOT SQUARE & DIVISION STREET
SOMERVILLE, N.J.
TEL: 722–6311
AREA CODE 201

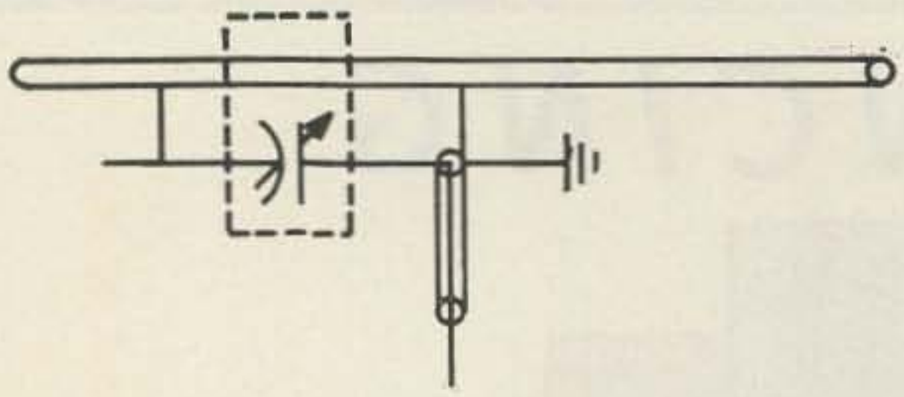


FIG. 2

LT

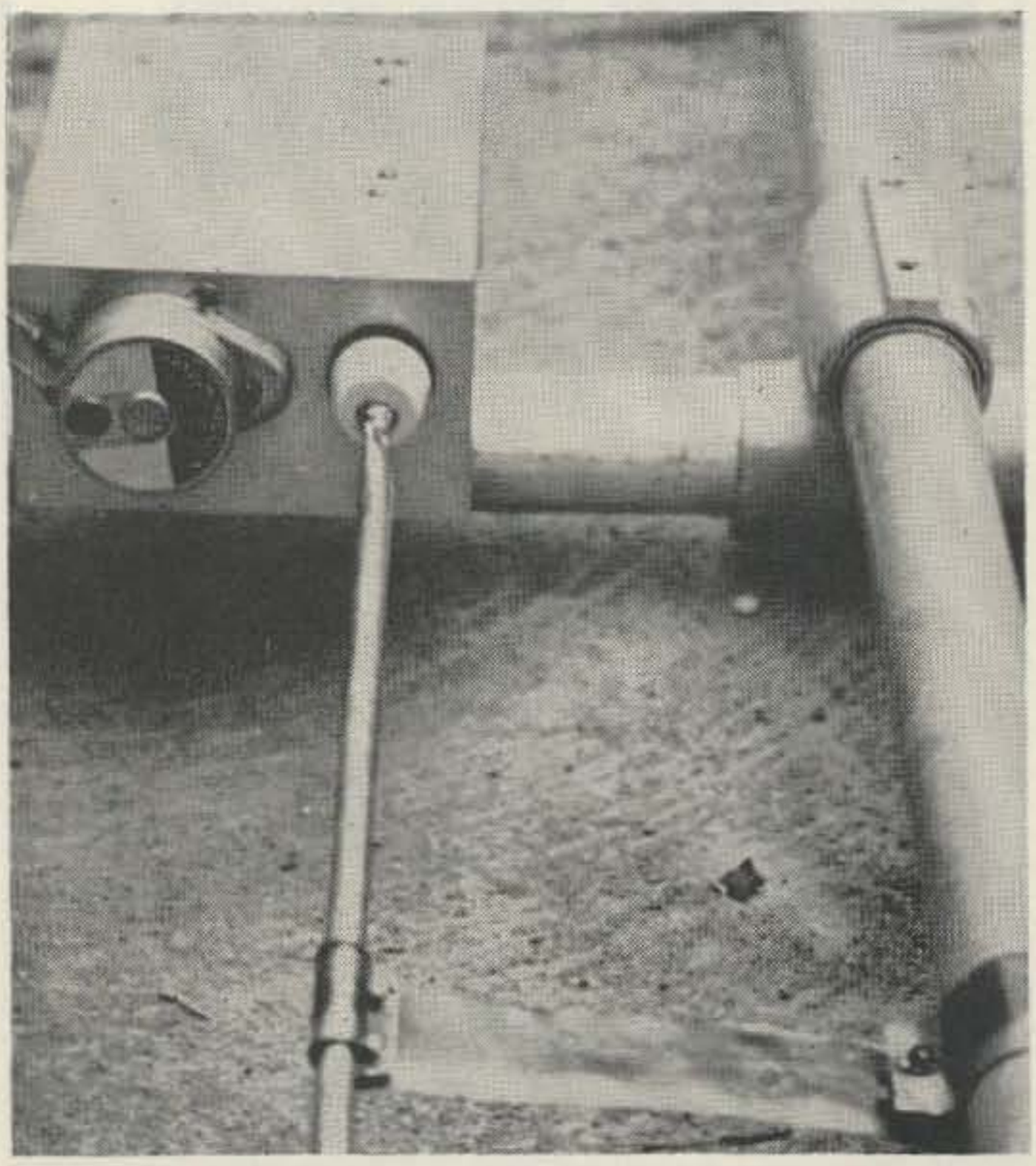
particular power limits. I had a 250mmfd 2KV variable lying around the shack and it was pressed into service. My object was to keep cost at a minimum and to use material that was on hand where possible. This part was one manifestation of the many bits of equipment bought on various trips to Cortlandt Street, however, it is not unique in nature and others can be easily substituted. The amateur must remain flexible if cost consideration is a prime factor.

The gamma matchbox can be made in the work shop on the inclement days of winter whereas the actual beam fabrication, because of its unusual dimensions, has to be constructed in the yard.

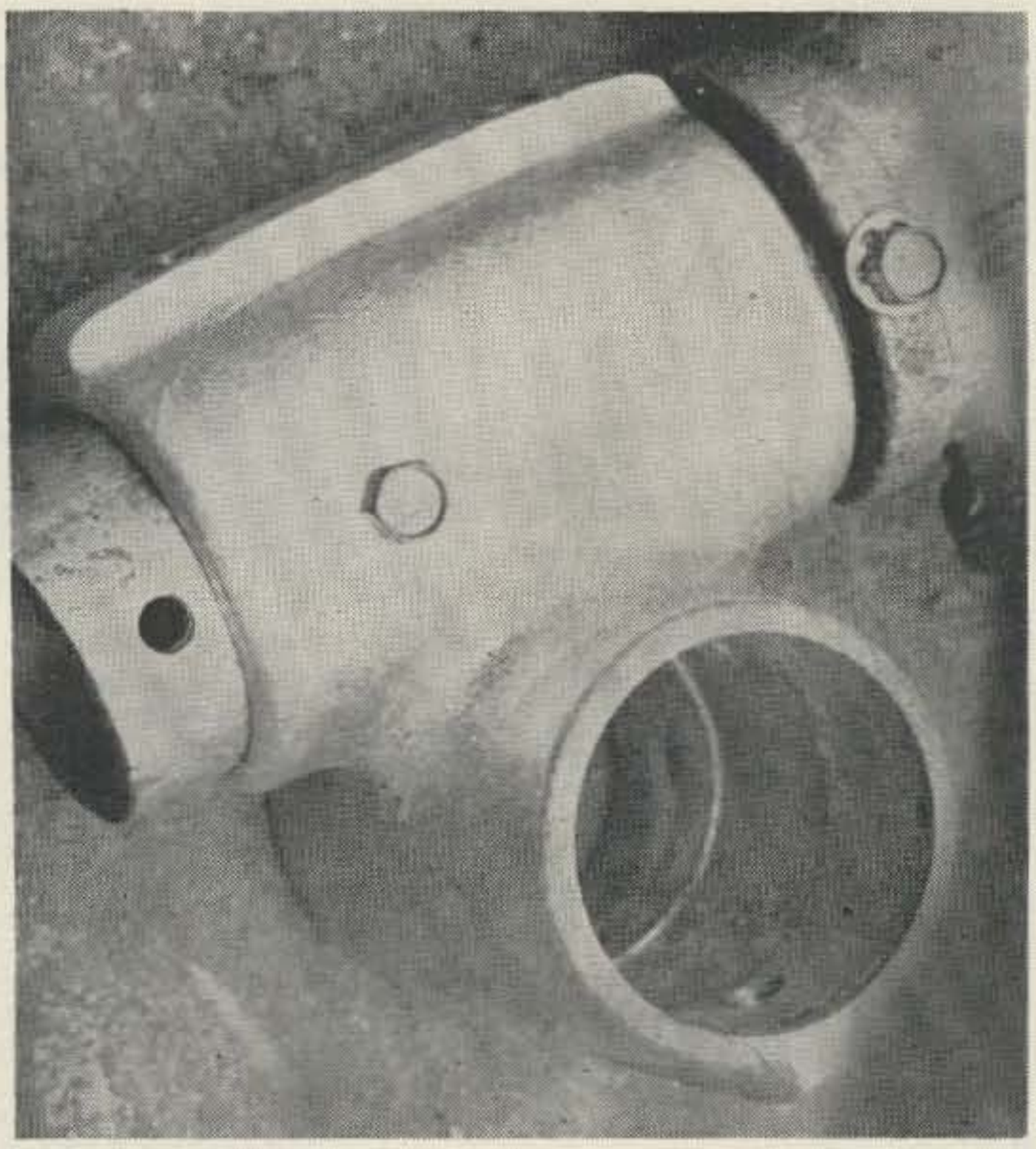
The Antenna

The boom is a standard length of electrical aluminum conduit pipe 10′ x 1¼″ (pipe is measured by the inside diameter). The secret to this particular beam, construction-wise, is the use of the Nu-Rail 1¼″ aluminum crosses which are far superior to the oxen yoke-type arrangements commonly available to the amateur. The crosses are more flexible in their uses, provide a greater degree of rigidity, support more weight, are less brittle and comparable in price. The elements are standard tube dimension that telescope perfectly for subsequent critical antenna adjustment. The elements are composed on one length of 12′ x 1½″-.058 wall tubing (tubing is measured by the outside diameter) which is attached at the boom center by the crosses. Telescoped two feet into both ends is a length of 6′ x 1⅜″ .058 wall aluminum (12′ length cut in half). Our dimensions thus far have netted us 12′ + 4′ on each side for a total of 20′ of element breadth. To make up the additional footage for either 15 or 20 meter operation, standard 1¼″ TV masting can be applied. For 15 m. one additional mast can be cut to make up the additional footage. For 20 m. operation additional material will be required. I might add incidentally, that the novice amateur after receiving his coveted General need only telescope the lengths of his elements and move into the 20 m. spectrum. With this in mind, full 10′ lengths of TV masting might be inserted fully into a telescoped position and allowed to extend short distances for 15 m. operation. At the later date, they need be only re-telescoped, adjusted to the new dimension,

(Read Swan ad then flip page)



A side view of the gamma rod, insulator, driving motor, copper bracket, and aluminum cross.



An enlarged view of the aluminum cross is in series with a plumbing "T" connection. The "T" is in series with the mast support and the cross is perpendicular to the "T." The bolt's head visible in the photo is to provide additional support and prevent movement. The bolt is fitted through both ends of the cross and secured with a nut.

STILL LEADING THE FIELD...THE SWAN SW-240

NOW...

WITH NEW STYLING AND EXTENDED CW COVERAGE

14,000-14,350 KC
7,000-7,300 KC
3,650-4,000 KC*

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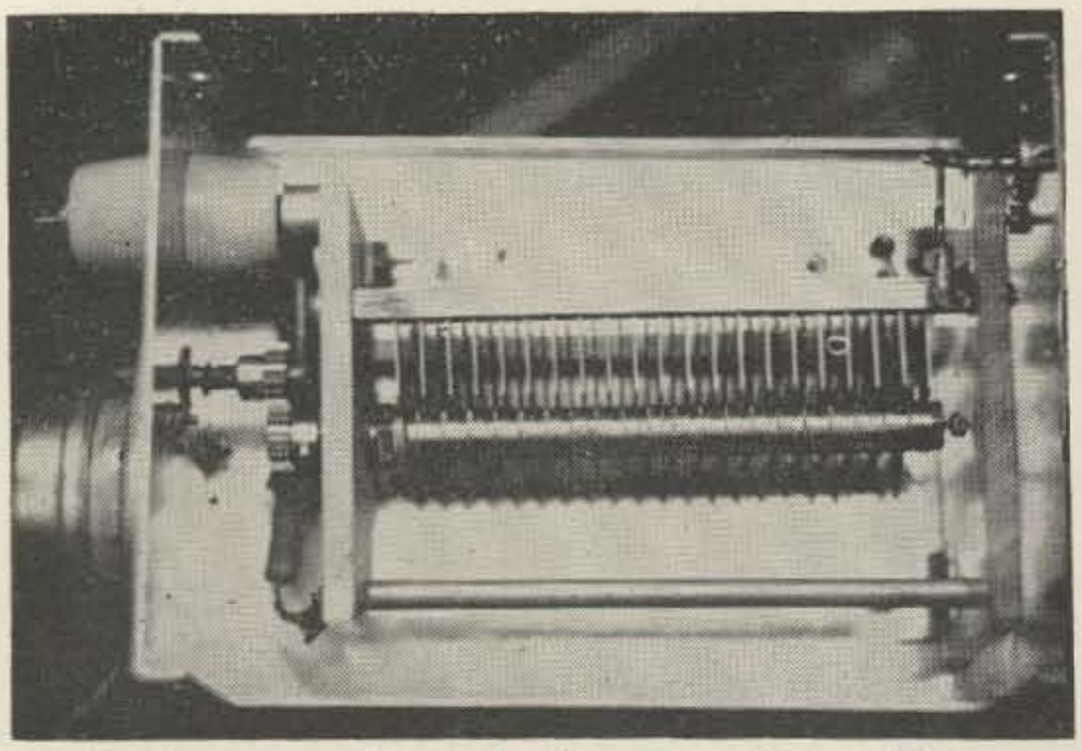


A close-up view of the capacitor, driving gear coupling, feed-thru insulator and motor.

and retuned remotely in order to provide 20 m. operation.

I have determined, by the formula contained in the ARRL Antenna Handbook, that the element dimensions are generally as follows:

1. Driven ..... 22′ 5″ (475 ÷ Fmc)
2. Director ..... 21′ 6″ (455 ÷ Fmc)
3. Reflector ..... 23′ 8″ (500 ÷ Fmc)

Needless to say, there are no hard and fast rules to determine exact element length. Ground charactristics, antenna height, and surrounding obstacles all contribute greatly to antenna operation. My antenna is situated atop a 71′ support and rotated by a prop-pitch motor. It might easily change its characteristics if I were to place it astride my chimney supported by a short length of pipe or pole, and driven by the more common TV CDR rotator. The burden of critical adjustment lies with the particular amateur and contingent upon the peculiar aspects of one's installation.

The gamma matching rod is ⅜″ copper tubing (chosen because it can be soldered). The sliding arrangement is made from a length of copper flashing which is approximately 6″ from driven element to matching stub. Both ends are bent around their respective elements and fitted with galvanized, stainless steel, or copper nuts and bolts. Once the proper impedance and tuning is completed they can be secured to prevent movement.

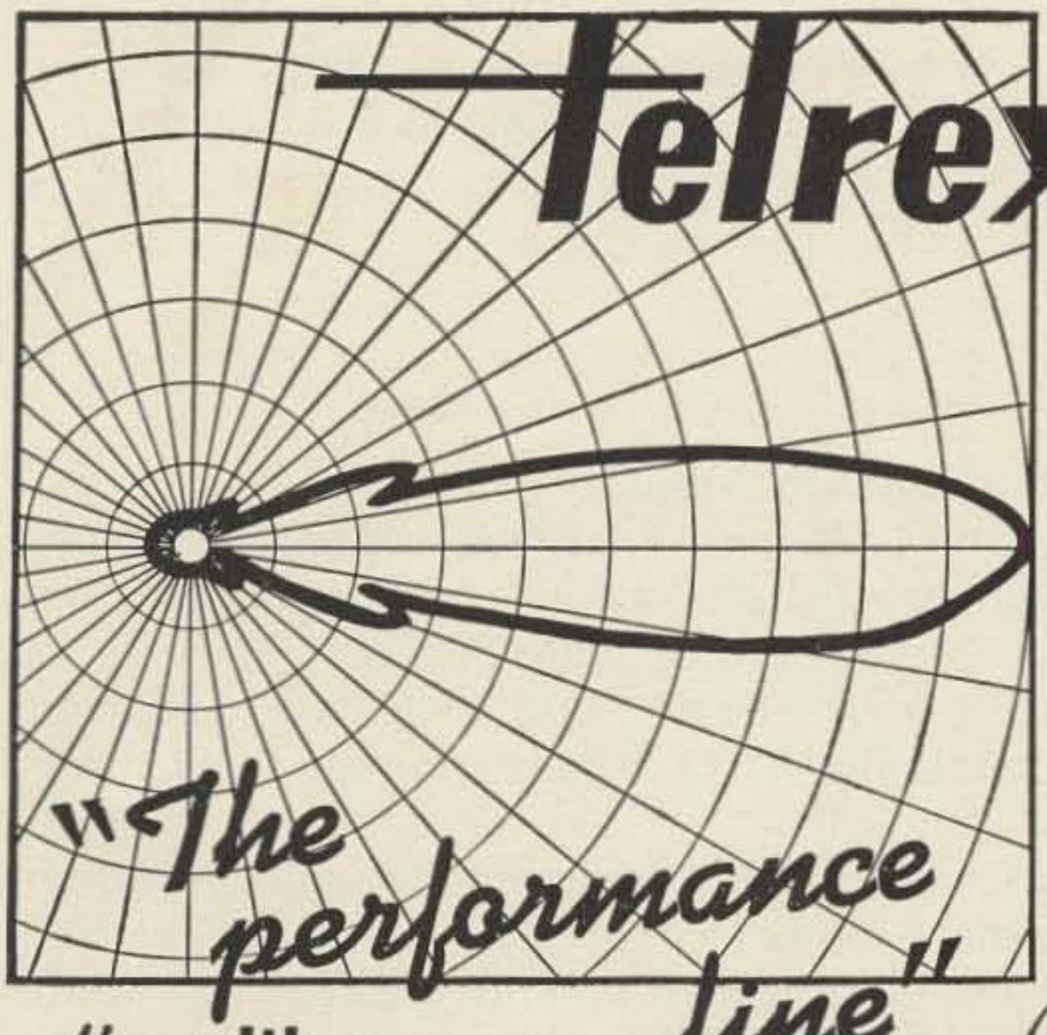
The test arrangement is standard, employing a grid dipper coupled loosely to an impedance indicating device. A length of co-ax cable should be cut to a multiple of a half wave to insure that the impedance of the antenna will be accurately reflected in the bridge device. The stub should be moved along the elements until a fifty ohm resistive value is determined. At the same time tuning is carried out with the remotely activated gamma and the point chosen where the combination of stub and gamma movement nets the desired result. SWR might then be determined to insure accurate tuning.

As mentioned in the ARRL handbook, a compromise between gain and front to back ratio is the best that can be strived for, since one is usually had at the expense of the other; however, a treatise on antenna design and pecularities are beyond the scope of this article. Reference is made to chapter 4, Multi-element Directive Arrays of the ARRL Antenna Handbook, 1960. Juggling with reflector length and/or element spacing can provide satisfaction for one's particular needs. It will probably be found, however, after exhaustive hours of experimentation, that the actual dimension will not vary greatly from those determined by formula.

The ground work has been laid and a general course has been charted for the design of a satisfactory beam. Cost factors have played an important role in the tri-element endeavor. My intention was to provide the most flexible beam arrangement keeping in mind my desire to move in and out of the several DX bands allotted to the amateur. Flexibility and ease of construction have been the keynote.

Construction Notes

1. Element to element conductivity, heretofore given little emphasis by the amateur, has been considered in my undertaking. A lubricating and highly conductive material manufactured by the Burndy Company of Norwalk, Connecticut and called Penetrox A has been incorporated. It has been designed for the electrician and available at electrical supply houses. Infinitesimal changes due to corrosion on aluminum joints are now reduced with the use of this ingredient. The element joint need only be lightly scuffed along the length of contact, and this material liberally applied. This not only provides a low resistant path for the rf, but also prevents the aluminum from becoming fused due to the corrosive tendency of the weather. Its application will insure smooth revamping of the elements when changes are contemplated.
2. In order to insure against wind noise, the ends of the elements should be plugged with cork. Before insertion, they can be dipped into shellac to prevent rotting and to provide a secure fit. The boom ends can also be corked which, in addition, will reduce the surface area and lessen the wind stress.
3. The ends of the elements should be slit with a hack saw and the hose clamps applied. It can be readily seen that a tighter fit will result.



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4. It might also be well to drill several small holes in the bottom of the minibox to provide drainage for moisture etc.
5. The small 1 rpm motor can be mounted either inside or outside the minibox. Convenient holes are provided which allow easier attachment to the outside of the box. Small gears attached to the shafts of the motor and condenser provide the coupling necessary to drive the capacitor. The 1 rpm motor was chosen since it allows for a more exact degree of adjustment. A length of lamp wire can be lightly coupled to the terminals of the motor before installation which will provide the ac voltage to drive the unit. It can hang loosely to the base of the supporting structure where tuning might be effectuated; once tuning is completed it can be pulled down. A permanent installation might include a length of wire taped to the coax line and allowed to enter the shack. Tuning might then be carried out in the comforts of one's home.

Parts List

Antenna

1—3 lengths 12'x1½"-.058 wall aluminum tubing*
2—3 lengths 12'x1⅜" .058 wall aluminum tubing*
3—1 length 10'x1¼" TV mast aluminum tubing (15 meters)
(6 lengths 10' TV masting if 20m operation is contemplated)
4—3 NU-Rail aluminum crosses 1¼"*
5—12 stainless steel aircraft-type hose clamps 1½"
6—6 1¼" thermos corks
7—Tube of Penetrox-conductive material

Gamma

1—3x5x7 aluminum minibox
2—approx 140-250 mmfd variable condenser
3—porcelain feed-thru insulator
4—SO 239 co-ax receptacle
5—30" length of ⅜" copper tubing
6—1 rpm motor-Barry Electronics—Broadway, N. Y. C.

**Available from Whitehead Metal Co. 12th Ave. & Christopher St., N. Y. C.*

. . . WB2CQM

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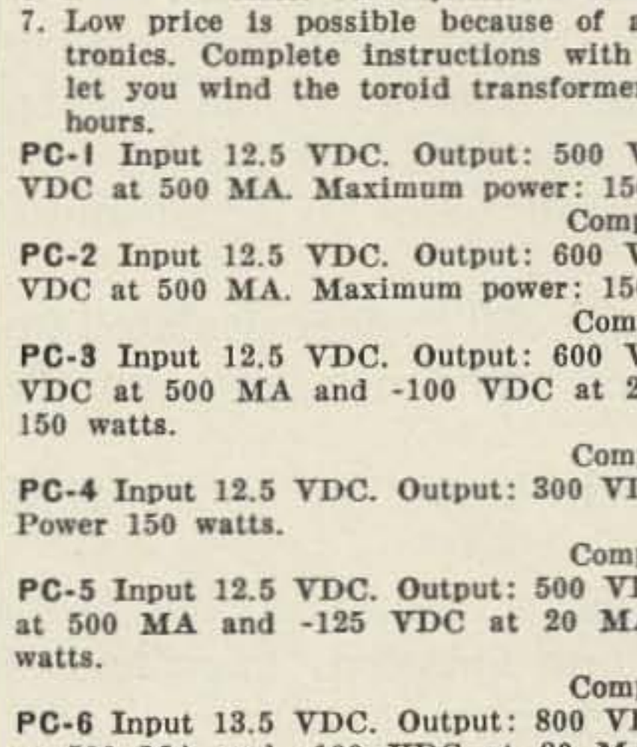

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PC-3 Input 12.5 VDC. Output: 600 VDC at 250 MA and 300 VDC at 500 MA and -100 VDC at 20 MA. Maximum power: 150 watts. KIT.....$39.95
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PC-4 Input 12.5 VDC. Output: 300 VDC at 500 MA. Maximum Power 150 watts. KIT.....$29.95
Completely Wired..... 41.50

PC-5 Input 12.5 VDC. Output: 500 VDC at 300 MA, 250 VDC at 500 MA and -125 VDC at 20 MA. Maximum power: 150 watts. KIT.....$39.95
Completely Wired..... 52.50

PC-6 Input 13.5 VDC. Output: 800 VDC at 300 MA, 270 VDC at 500 MA and -100 VDC at 20 MA. Maximum power: **300 watts.** Available only as completely wired and tested....$89.95

For **SWAN, COLLINS,** and **SONAR** use the PC-6 for full output power. Use the PC-3 for these units with slightly reduced P.E.P. and a lower price. For the **HALLICRAFTERS** transceiver use the PC-5. For ARC-1 and other surplus gear use the PC-4. Other output voltages are available as special units. Write for prices. All prices are F.O.B. Cardiff, Calif. Shipping Wt. 3 lbs. California customers include 4% sales tax.

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Vernon Trexler W5IUR
2142-B 35th
Los Alamos, N. M.

Rules of Thumb

or

How to Get in the Ballpark and Stay

1. Removing the cathode by-pass condenser reduces gain to approximately one-half.
2. Removing the screen by-pass condenser reduces gain to approximately one-tenth, and in some cases causes instability.
3. When you calculate the power dissipated in a resistor by the power formula, double this value when you pick the resistor.
4. Cathode by-pass condenser's impedance at the lowest frequency you want to pass is usually one-tenth the resistance of the cathode resistor.
5. Increasing size of coupling condenser lowers frequency response, increases hum and instability, and vice versa.
6. Screen by-pass condenser's impedance at the lowest frequency you want to pass is usually one-tenth the resistance of screen by-pass resistor.
7. To vary rf gain, vary the screen voltage of the pentode or tetrode.
8. When you have tuned grid tuned plate circuits at the same frequency, plan to neutralize all tetrodes, pentodes and triodes in rf amplifiers. Never mind who said you didn't need to.
9. Multiply the Q of a coil by its calculated impedance to get the impedance of a parallel tank circuit.
10. Build on a steel chassis for better audio shielding.
11. Use brass, copper or aluminum chassis and shielding for rf. These materials have less effect on the tuned circuits.
12. Coils should be spaced coil diameter away from surrounding objects for best Q. Again, use non-magnetic material for shielding.
13. Coil shapes in general should be two parts long to one part high for best form factor.
14. Build your VFO's, etc., strong like a battleship for best stability.
15. Build all your frequency determining circuits, dials, shafts, coils, condensers, etc., on the same mounting plate for best stability.
16. Phenolic, lucite, and poly are fine, but for minimum VFO drift use ceramic coil forms and stand-offs.
17. Ceramic NPO trimmers are good, but air trimmers are better for VFO's, etc.
18. Regulate screen voltage and perhaps plate voltage of your VFO, but try regulating the filaments, too, if you want a stable VFO.
19. Just because it's single sideband both sidebands are there, one just has more signal strength than the other. If you have 40 db of sideband suppression and the signal generated is 40 db over S9, then the suppressed sideband is S9, and a carrier suppressed 50 db would be around S7 or S8 on a perfect S meter under the same conditions.
20. In general, an S meter reading means the receiver is turned on.
21. To get out well and have your CQ's answered in general, 100 watts seems to be the break-over point on AM; but if you really want to get out, go full power, use a beam, and raise the antenna height.
22. Why shield linear amplifiers? In general, they don't generate TVI.
23. Audio for communication is about 300 to 3000 cycles—what's yours?
24. Beginners tend to make circuits too elaborate. Keep it simple, it will last longer and work better.
25. Crystal current causes drift, 60 ma is far too much.
26. Power transformers can put out 30 to 50 per cent more current in intermittent amateur service than their published value. In SSB this value can be 100 per cent or more of peak load.
27. A 1 db change of audio is barely detected by the ear. A 3 db change is a prominent change.
28. Some tubes turn blue in operation, but generally it means the tube is gassy and is a "flat" tube which draws more than normal current and should be replaced.
29. Don't expect a circuit used from a book or magazine to work the first time. First, the article goes through too many hands to be

QLF

Karl Kopetzky K9AQJ

Well I never thought that I'd see the day when the well-known ham term *OM*, standing for *Old Man* would accurately describe *yours truly*. When I first started in ham radio, some half-century ago, then called "wireless," there was no such term. The *ARRL* had not yet been born, and the oracle was the venerable *Hugo Gernsbach* of *Electro Importing Company* fame. I never found out what it was that *Hugo* imported, but it was an experience to go thru his store on Cortlandt Street in New York City.

Where was I? . . . Oh, yes, back about 50 years! Well, like I was saying, the *ARRL* had not yet come into being, and *The Old Man* who was later to be so well-known for his pithy (*watch that spelling, typesetter!*) remarks about modulation and operating practises was, for all that I know, *The Young Man*. Anyway, it was but a scant 7 years later that the term OM was to become common, and it was to laugh that I, with the dawn of babyhood still on my rosy cheeks, at the tender age of 14 would be called OM, or Old Man. Now that I *am* an Old Man . . . jeeese, I could do without it!

Some of the fondest memories I have of "those good old days" were when after operating for hours and hours at the key of the half-gallon spark set, I finally made it a solid QSO with a station just 3 miles away! But the thrill of thrills was when I read in the forerunner of *QST* that *1SW* had been copied solid in Nauen, Germany! That's not bad for spark!

Still later I was to face an enraged father at about 3 AM in the top floor of his home where I had a "generator" running to furnish the High Voltage to four *Western Electric* VT-2's in parallel in a *Hartley Osc.*, and was told unceremoniously to "get the H--l to bed and to stop this infernal noise. And furthermore, I don't give a D--m whom you are talking to." My Dad, God love him, was a Colonel of the Army even at home. So I mentally saluted him in the fashion I thought

(Turn to page 43)

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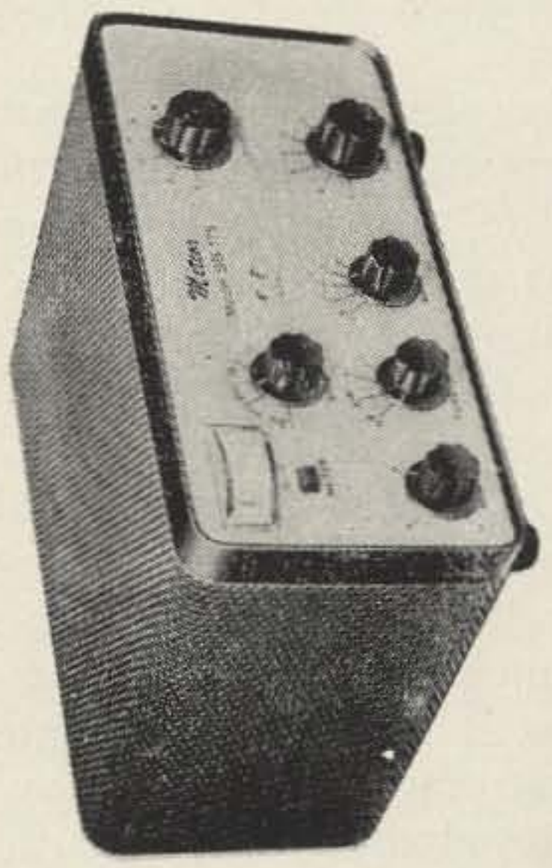
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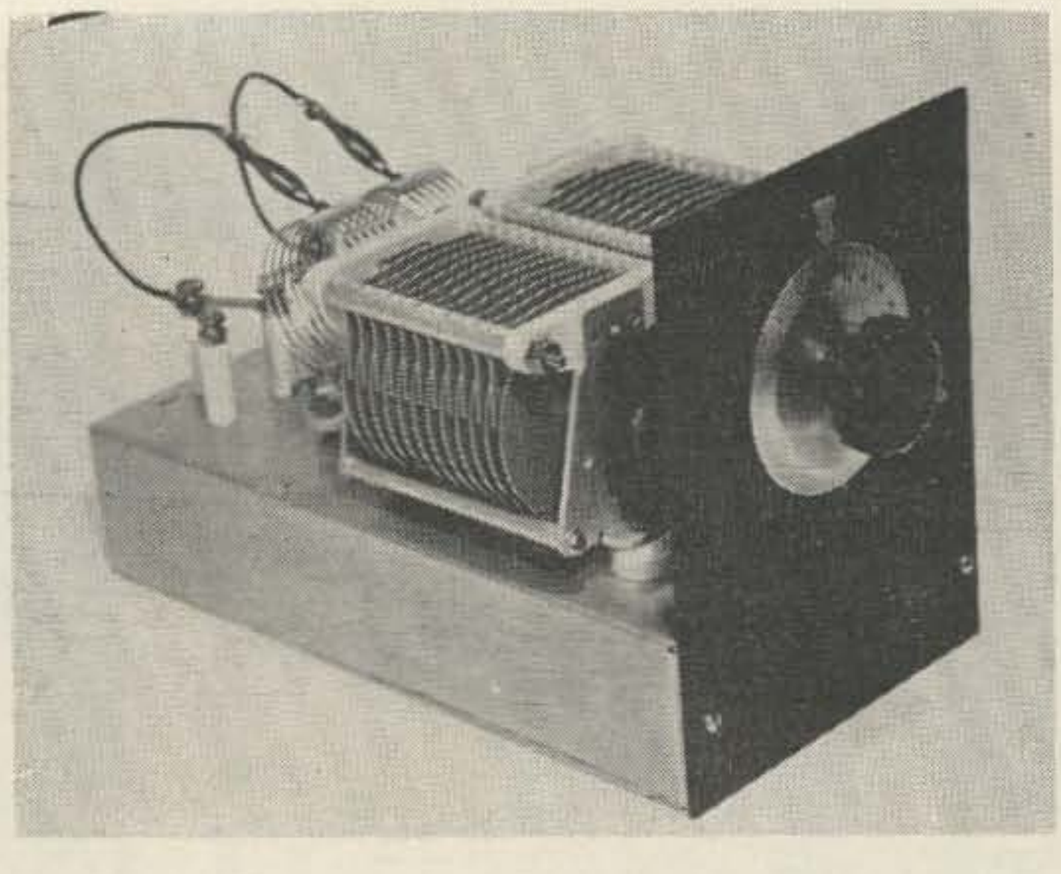


Fred Herr W3WPV
911 Old Manoa Road
Havertown, Pa.

Photos by: Thomas C. Rudolph

Combination Antenna Coupler

A notice from the FCC usually indicates improper operation of radio transmitting equipment. One of the worst bugaboos of improper operation is the emission of harmonics which fall outside of the amateur bands causing possible serious interference to other services.

The purpose of this article is to describe an antenna coupler that will help reduce the emission of harmonics and at the same time provide a better match between the transmitter and the antenna. As the name implies, it is a combination coupler because it can be readily changed from series operation to parallel operation by simply changing two jumper connections.

Before starting the coupler discussion let us see what happens between the transmitter and the far end of the antenna. The most efficient antenna is one that is cut to a definite length for a single operating frequency. Efficiency falls off when this antenna is used on any other frequency. However, the average amateur radio operator does not have the means or the space to erect a separate wire for each frequency that he wants to operate on. Consequently, most of his operating is done on one antenna. It might load up nicely and put out good strong signals on any one of several frequency bands, but not being designed for one single frequency, it will have a tendency to emit signals on a frequency of double, triple, and more, of the fundamental frequency. When this happens your incoming cards take on a drab appearance and do not have the bright colors of a QSL.

Right then is a good time to take a look at your transmission line. Actually, the best time to take this look is before the cards from FCC begin to roll in.

Harmonics of the operating frequency are generated inside the transmitter, and if there is nothing to stop them they will be flung by the antenna in all directions along with the

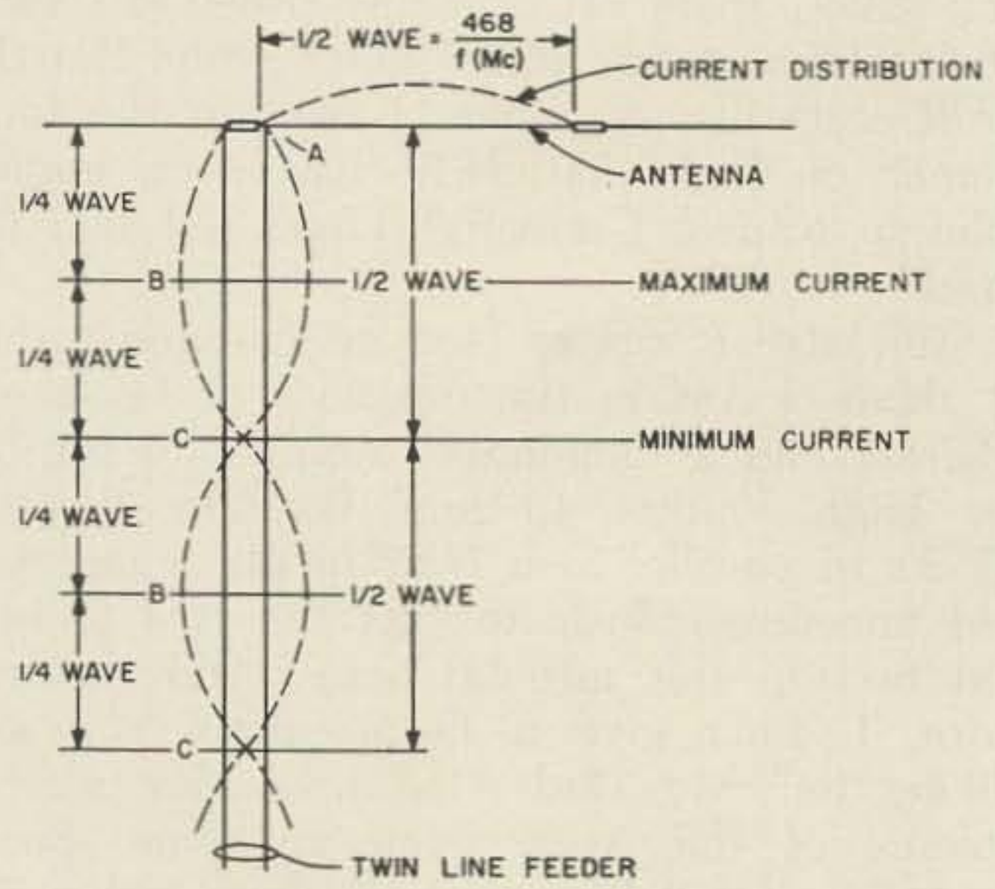
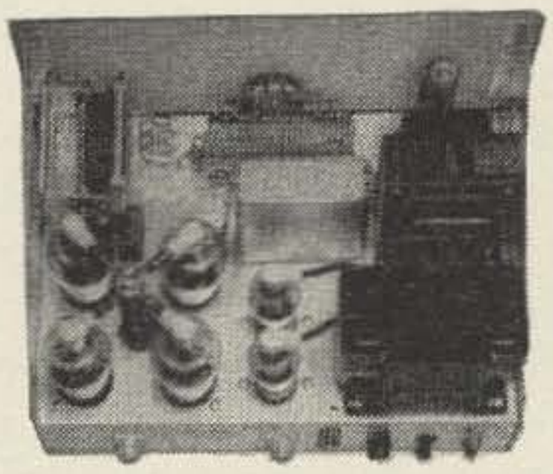


FIGURE 1

YOU CAN'T BEAT THIS KIT FOR VALUE!



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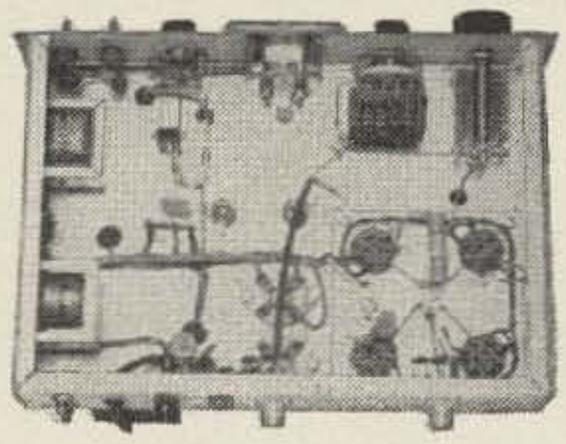


IT'S EASY TO ASSEMBLE AND WIRE — QUALITY THRU AND THRU

The P&H LA-400-C is not an ordinary kit, because a lot of the assembly has already been done for you. The plate transformer, filter choke, plate tuning capacitor etc. are mounted. Plate coil and band switch are assembled and mounted. Output loading capacitor network is assembled; in fact — about all you have to do is mount small parts, mount sockets and finish the wiring. As for performance — just ask anyone who uses an LA-400-C. Just compare his signal with the so-called "talking kilowatts" — it will be mighty hard to tell 3 DB difference. The difference in cost will pay for a good scope, plus a top notch receiver. One other point — Where else can you get a warranty such as P&H gives you on the LA-400-C ?

ONE YEAR WARRANTY ON ALL PARTS AND TUBES !

The 80 thru 10 meter band-switching pi network is designed for 800 watts PEP SSB, 400 watts CW, FM or FSK and 230 watts Linear AM (controlled carrier) or 185 watts (constant carrier) with 50-70 ohm output. Popular 100 watt SSB exciters require no swamping or matching networks to drive the low Z untuned input. Grounded grid circuit uses four 1625's or 837's on customers request. Meter reads RF drive, plate current, RF amps output. New modern compact 9" X 15" X 10½" gray cabinet also contains power supply using 816's. TVI suppressed, Parasitic Free.

*Prices effective June 15, 1962

LA-400-C Wired & Tested $219.95

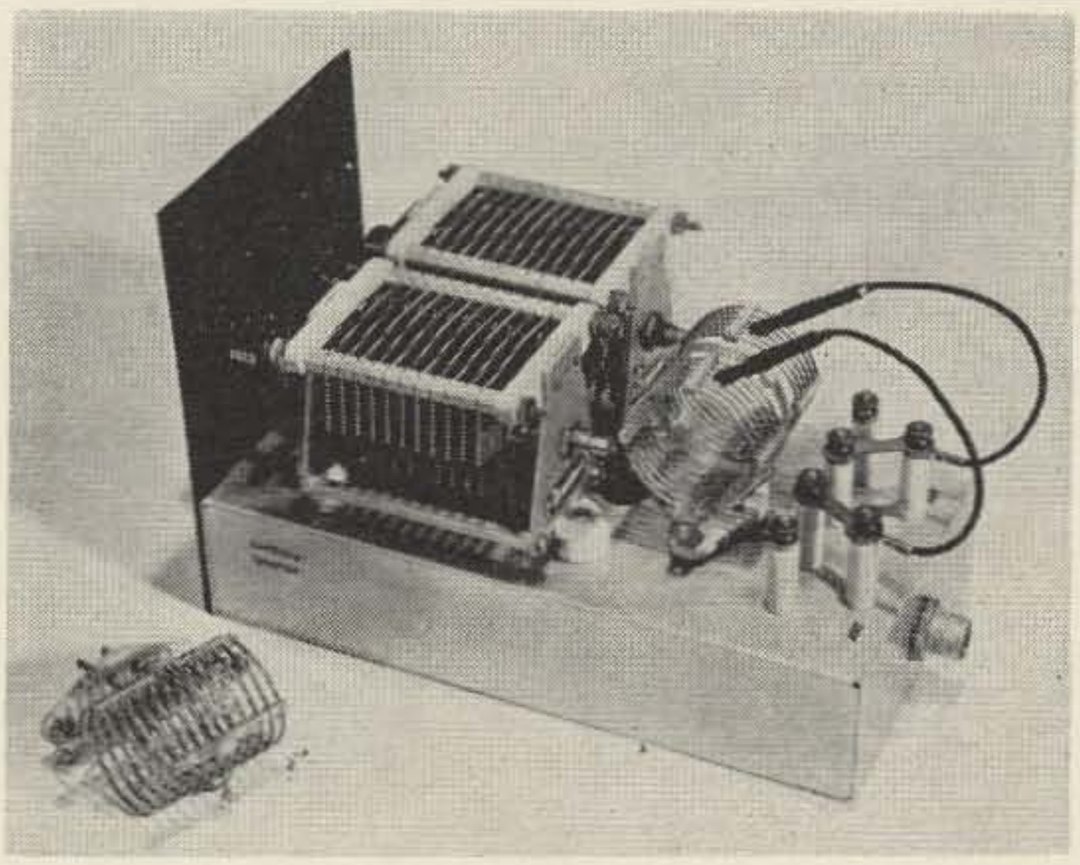
Slightly higher West of Rockies.

P&H ELECTRONICS INC.
424 Columbia • Lafayette, Ind.

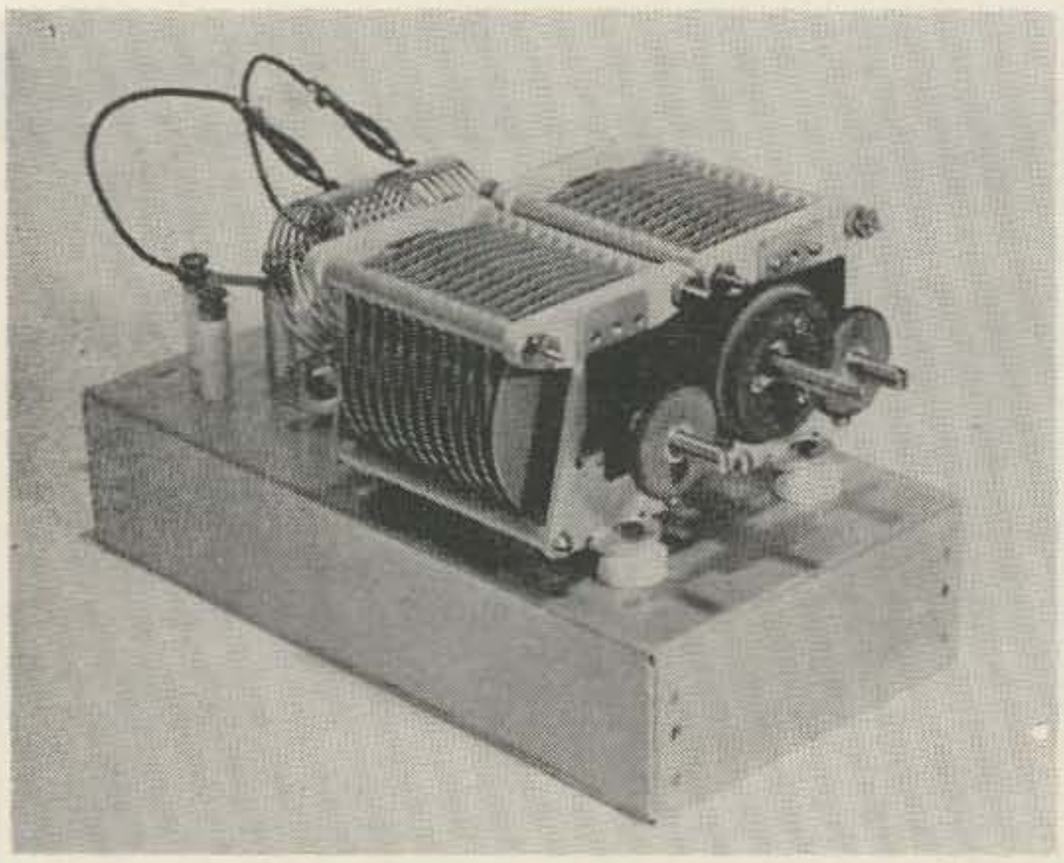
NOTE: Due to a printer's error, the price of this unit is shown incorrectly in the June issue.

fundamental signal. The handbook says that harmonics can be greatly reduced by means of an inductively coupled circuit in the transmission line and continues at great length to discuss the advantages of antenna couplers. In reading the handbook discussion we find that a coupler, in addition to its ability to attenuate harmonics, provides a dandy means of matching the transmitter output impedance to the antenna input impedance. With these two items of equipment properly matched, the tank circuit of the transmitter is working efficiently and the greatest amount of power is transferred to the antenna. However, a discussion of impedance matching, as such, is outside the scope of this article. We started out to deal with antenna couplers as a weapon against green eyed harmonics and will proceed with the story.

Antenna theory says that the best place to insert a coupler in a feed line is at a point of maximum current or minimum current. For use at a point of maximum current, a series tuned coupler is required; at a point of minimum current a parallel tuned coupler is needed. To save a thousand words take a look at Fig. 1. The diagram shown here will serve in an elementary way to locate the two current points referred to. In keeping with utmost



simplicity an end-fed half-wave Zepp antenna is illustrated. The dotted lines indicate the distribution of current in the antenna and feed line. Because the antenna is cut for a half wave, the value of current is at a minimum at each end and at a miximum in the center. In the case of the feeder, the value of current at A, where the feeder connects to the antenna, will be at a minimum. Other points of minimum current will be at points marked C, each a half wave apart. The points of maximum current are at locations marked B, which are also a half wave apart.



The length of the feeder line is usually dictated by the location of the antenna. In order to get the antenna in an area clear of trees and buildings, it might be necessary to use a long feeder line. The line between the coupler and the antenna should be cut to a length equal to a quarter wave or a multiple of a quarter wave. If the chosen length happens to be an odd multiple of a quarter wave the end of the line at the coupler is at a point of maximum current, such as at points B, and the use of a series tuned coupler is indicated. If the line length is equal to an even multiple of a quarter wave, a parallel tuned coupler is needed because it will be inserted at a point of minimum current. The line from the transmitter to the coupler can be any length.

The feed line to a folded dipole, which is a different type of antenna than that illustrated, can be of any suitable length. In this case it would be necessary to determine, through experiment, which type of coupler tuning will give satisfactory antenna loading. The amateur is forever experimenting with his antenna in the hope of finding the best combination of antenna, feeder, and location. For this reason a coupler should be used that could be readily changed from series to parallel tuning and thus avoid the necessity of having two pieces of equipment which are almost alike.

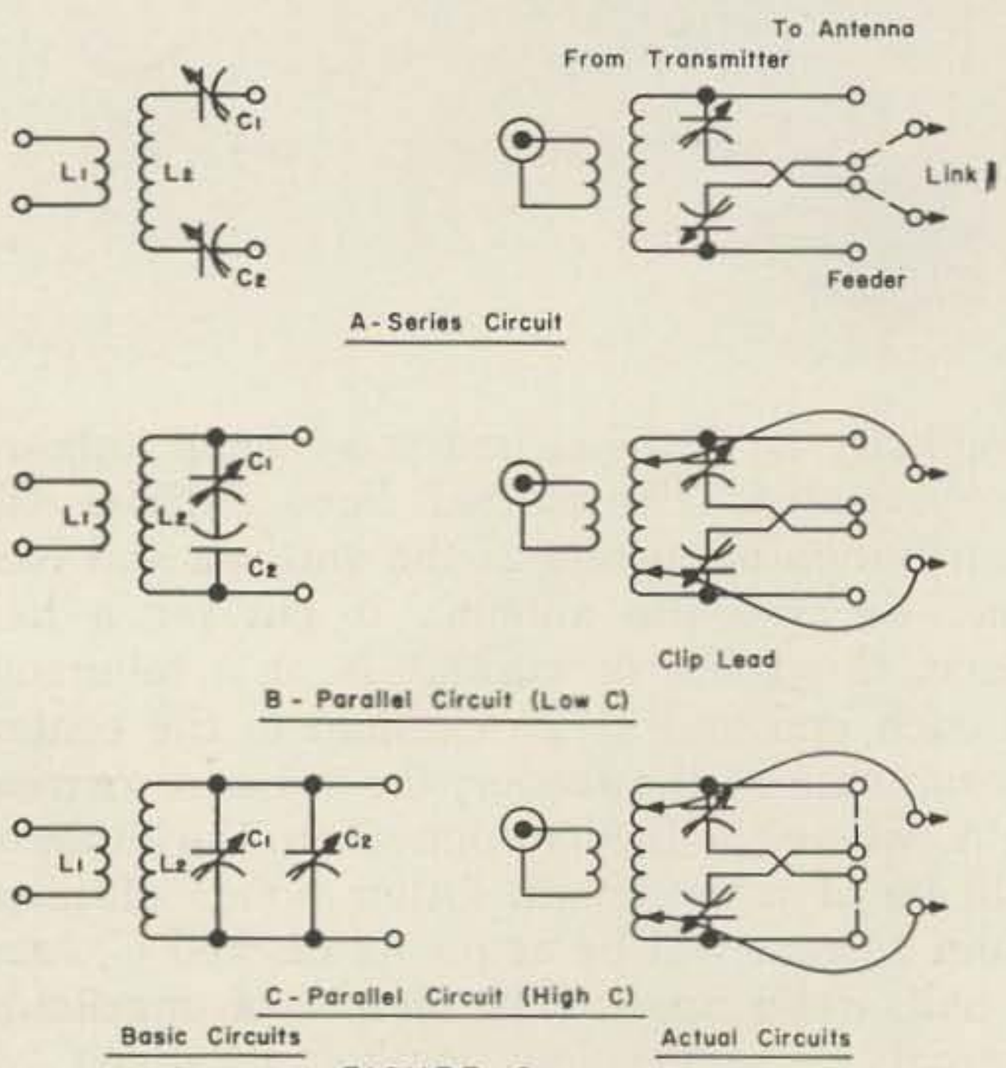


FIGURE 2

The basic diagrams of antenna couplers are shown in Fig. 2. Diagram A is for a series tuned coupler. Diagram B is for a parallel "low C" coupler and C is for a parallel "high C" coupler. Opposite each basic diagram is the actual circuit for each type of coupler. Here is where the advantage of a combination coupler is realized. To change from one type of tuning to another it is necessary only to arrange the interconnecting links as indicated by the dotted lines on the diagram.

Each link is made from a piece of copper or brass strip with a hole in each end, the holes spaced 1" apart on their centers. The links are supported on porcelain through-panel insulators and held in place with knurled battery type nuts for easy removal. Ordinary copper wire can be used in place of the links.

The coupler is constructed on 5" x 9½" x 2" aluminum chassis. A co-ax connector is provided for the input from the transmitter. The output connections are for twin-lead, but a co-ax connector may be used if desired. The panel is a piece of ⅛" tempered masonite with two coats of Du Pont black wrought iron paint and the dial pointer is the red arrow from a Gem safety razor blade dispenser. The placement of wiring is not critical, but it should be arranged as symmetrically as possible.

Fig. 3 shows the construction details of the link end of the chassis. No details are given for locating the coil and condensers as this will depend on the parts available to the constructor. The through-panel insulators, however, should be located accurately to the dimensions shown so that the links can be readily interchanged between any two of the insulators. All parts are mounted on the top surface of the chassis and the wiring is concealed inside. The two condensers are mounted on stand-off insulators to insulate their plates from the metal chassis.

Another good feature of the coupler is the method of driving the condenser shafts. As can be seen in the photographs, each shaft is fitted with a fiber gear. The two gears are driven by a third fiber gear whose shaft extends through the panel to the dial. This arrangement makes for easier tuning and insures both sides of the feeder being in balance.

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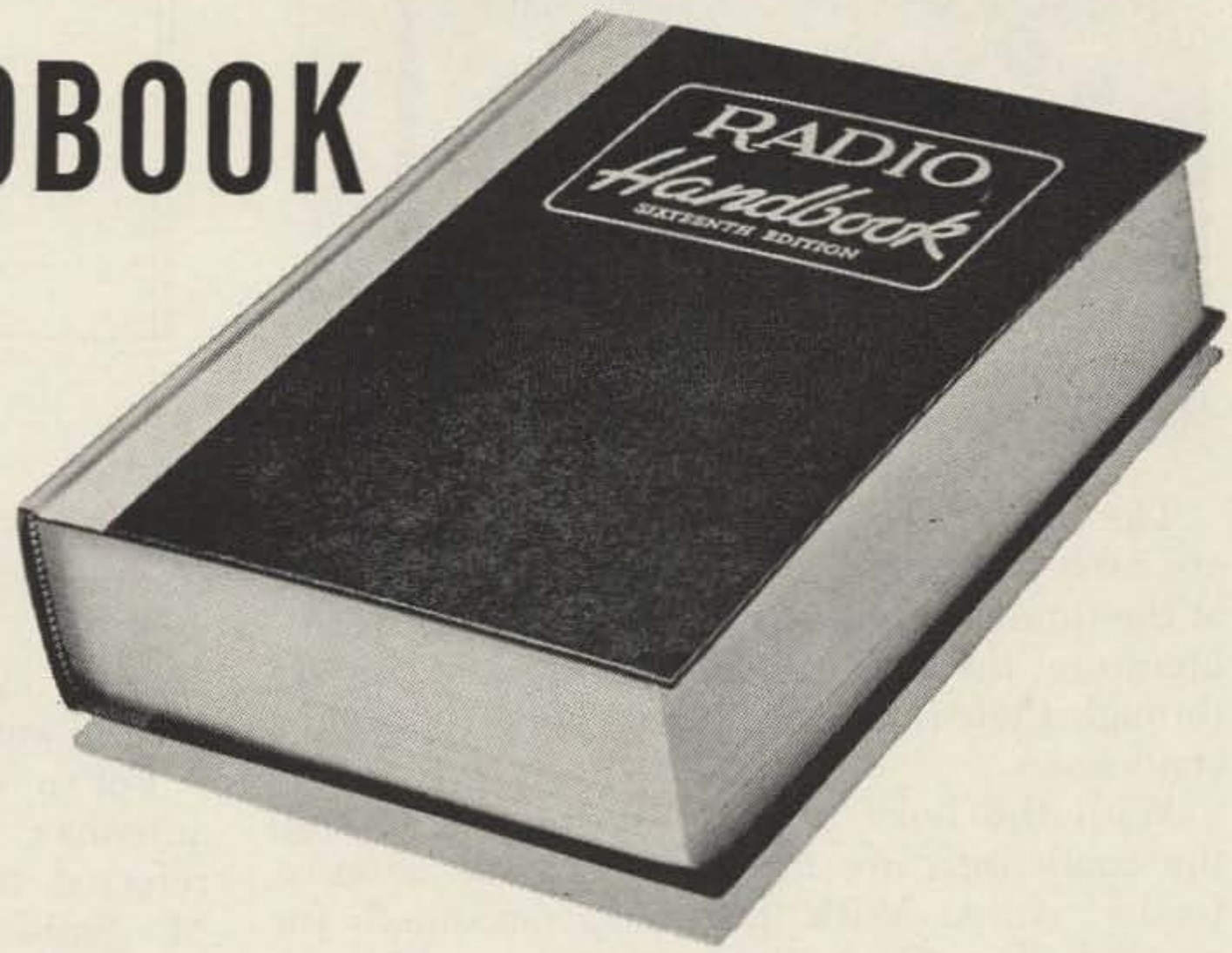

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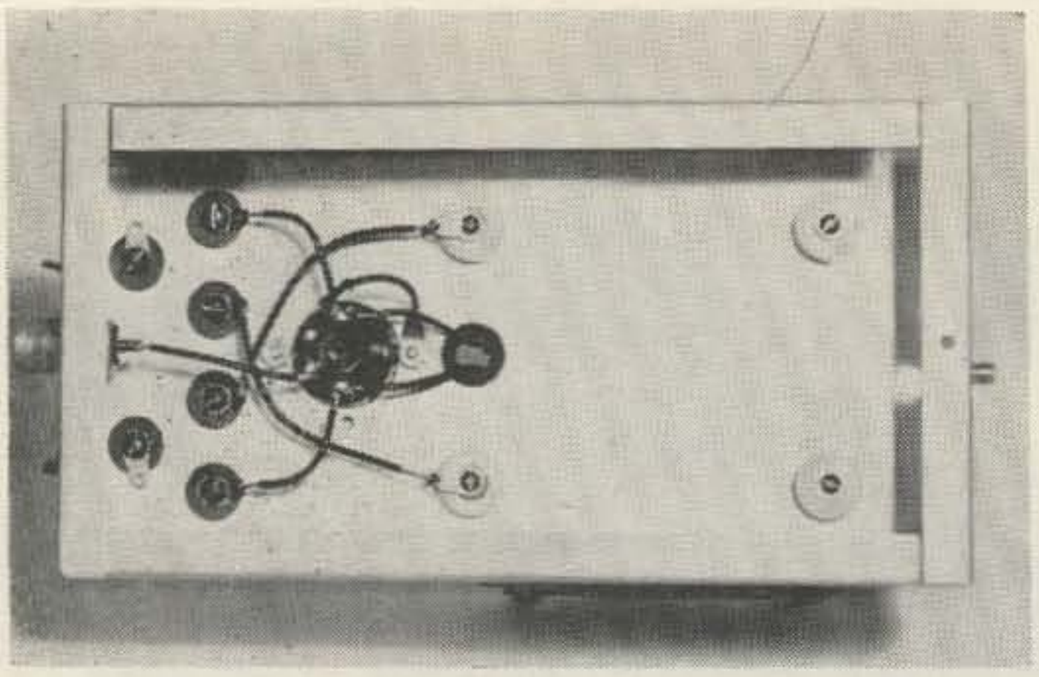

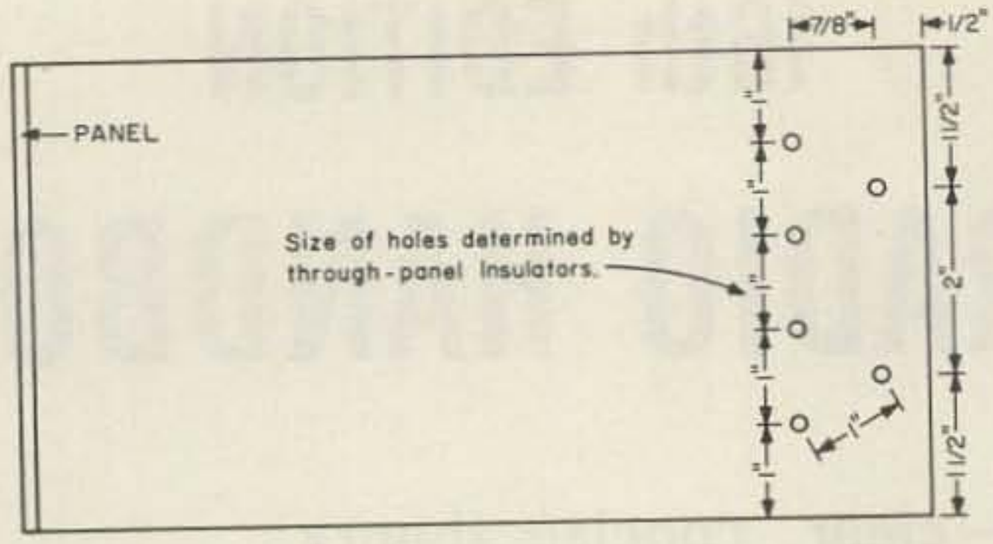

PLAN OF 5" x 9 1/2" x 2" CHASSIS

FIGURE 3

The condensers used in the model pictured are each 150 mmfd because they were on hand at the time of construction. According to B & W literature, the JVL and BVL coils will resonate through their respective bands with 100 mmfd condensers.

With the links arranged for series tuning, the condensers are in series with the antenna feeder wires. With the links arranged for parallel "low C" tuning, the two condensers are in series with each other and in parallel with the coil. In the parallel "high C" arrangement, both condensers are in parallel with the coil. Where the antenna feeder system indicates the use of parallel tuning it should be possible to get satisfactory loading with either the "low C" or the "high C" arrangement. For greater flexibility in parallel coupler adjustment, leads have been provided for clipping to the coil turns. The coil turns that provide the best loading should be used, and the number of turns on each side of the coil center should be equal to provide feeder balance. For series use the clips are not used and can be fastened back out of the way.

In order to tune the coupler an SWR meter should be inserted in the line between the transmitter and the coupler and the coupler adjusted for the lowest SWR ratio. In the absence of an SWR meter, the coupler can be adjusted for maximum power to the antenna by the use of an rf ammeter, field strength meter, or lamp bulb coupled to the feeder.

If the antenna is used for receiving as well as for transmitting and the send-receive relay is located between the transmitter and the coupler, a bonus feature can be realized. When the coupler is properly tuned for transmitting on a particular frequency the strength of the received signal is greatly increased. In fact, it is possible to tune the coupler merely by tuning for maximum signal strength in the receiver, or for maximum S meter reading.

In using the combination coupler it should be possible to find one of the three tuning arrangements that will operate satisfactorily with almost any of the popular antennas, including the all-band type. The use of a coupler will go a long way toward providing more efficient operation and greater peace of mind for the amateur.

For a down to earth discussion on wire antennas, feeders and couplers, the reader is referred to the excellent articles by Richard M. Smith W1FTX which appeared in the July and August, 1952 issues of QST Magazine.

. . . W3WPV

Parts List

C1, C2—100 mmf variable condensers
L1, L2—Plug-in coils with links, as follows:
For power to 75 watts 15 meters—B&W JVL-15
20 meters—B&W JVL-20
40 meters—B&W JVL-40
80 meters—B&W JVL-80
For power above 75 watts 15 meters—B&W BVL-15
20 meters—B&W BVL-20
40 meters—B&W BVL-40
80 meters—B&W BVL-80
(Fixed link coils, JCL and BCL, can also be used)
6—through-panel insulators
4—stand-off insulators (for mounting condensers)
2 copper links
1—co-ax box connector
2—Pee Wee coil clips
1—5-pin coil socket
Miscellaneous hardware—fiber gears, shaft, etc.
1—5" x 9½" x 2" aluminum chassis

$5 Vertical

Clarence Wager K6TBW

There's nothing particularly exciting about a vertical antenna, what with beer-can verticals, drainpipe verticals, ad infinitum, but most of the verticals which seem practical also seem to involve considerable expense. Here is a vertical antenna which won't cost you more than five bucks or so, and may cost almost nothing, depending on what you have in your junkbox.

The materials needed are simply six strain insulators, about 90 feet of wire, and a hunk of coax. The coax is the only item which is very expensive. To construct the antenna all you need is a tree with a limb handy about thirty feet above the ground. Cut three lengths of wire about thirty feet long, fasten insulators to each end, and hang them from the limb. Space the wires about a foot apart. The insulators on the bottom ends of the wires are secured to stakes driven into the ground, also spaced one foot. The three strands of wire are shorted out at top and bottom with three foot pieces of wire. The ground system is a simple ground rod driven as far into the ground as possible. The antenna is fed with either 50 or 72 ohm coax. RG-59/U works fine.

That's all there is to it. If you want to be fancy you can use radials, but the antenna works OK without them. The best part of all is that the antenna, although designed for 7 mc, also loads with no trouble on 14 and 21 mc, and hits the low end of the 3.5 mc band too. By actual scientific tests the SWR seems to be fairly good everywhere (we didn't get bitten when we touched the key). On 3.5 mc the antenna isn't as good as a dipole, of course, but seems to do the business. Since the author runs CW nearly exclusively, we didn't try trimming the antenna for the phone bands, but naturally this could be done by anyone with the time and a few feet more wire.

For the guy who feels like improving things there are a few points we might mention. Metal tent pegs might be best for securing the bottom of the antenna. You have to watch for roots, and metal pegs would probably penetrate better than wood. In the antenna described number 16 stranded wire was used, but larger diameter wire would probably be better from both electrical and mechanical standpoints. . . . K6TBW

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MINUTE MOTOR

Fred Herr W3WPV
911 Old Manoa Road
Havertown, Pa.

Would you like to know how much time you spent on the construction of a piece of radio equipment? With the use of the easily made device described in this article you can have a record of time spent on any project. The device consists of a motor driven counter that keeps an accurate count of the elapsed hours and minutes spent on your construction project.

In almost all types of construction and fabrication a knowledge of time consumed serves as a basis of cost analysis and is of great importance to all concerned. This is not exactly true in the case of home constructed equipment as the cost of time consumed is not important, being charged, usually, to enjoyment, education and relaxation.

Amateur radio is a hobby with many types of adherents, and it is believed that the amateur who prefers to build all or part of his equipment is in the majority. Amateur radio, in fact, owes its existence to the experimentally inclined pioneer who had to build his own equipment because commercially made equipment was not available at the time. With a large percentage of amateur radio equipment presently available in kit form, more and more hams are turning to this form of construction to acquire much needed gear at an appreciable saving in cost. When a prospective buyer contemplates the purchase of a piece of equipment in kit form, his first question will probably be —"How long will it take me to assemble and wire that kit?" After a kit is assembled and completed the constructor is always asked how many hours were required to do the job.

Whether the task is easy or of long duration it is of great personal satisfaction to know how much time was consumed on a project. During the construction period a "time consumed" record can be kept by a written notation indicating the time of starting and stopping each work session. Upon completion the total time used can be determined by totalling the sessions. This method is alright but could become quite tedious on a large project where many work sessions and interruptions might be involved. The use of a time clock or an elapsed time meter would be ideal but the cost of such equipment would probably exceed the cost of the equipment being assembled.

After using the pencil method on several projects it was given up as a bad job, as quite often the starting time or the stopping time would be forgotten, or allowance for frequent interruptions would not be recorded. In order to find a more accurate method of time recording the junk box was resorted to and gave up the parts that were assembled into the Minute Motor. The parts consist of a Haydon synchronous time motor and a Veeder counter, both of which are available on the surplus market at very reasonable prices.

The construction of the Minute Motor is very simple and can be accomplished in an hour or so. The motor and counter are mounted on a small base or chassis along with a flush mounted 115 vac receptacle. The shaft of the motor is fitted with a small lever which is drilled and tapped for a small machine screw to hold it in place on the shaft. The other end of the lever is drilled to take a connecting rod, which, in turn, is connected to the reciprocating lever of the counter. In operation, one full revolution of the motor will advance the counter one number. The length of the motor lever is rather critical and should be sized so as to advance the counter one number only for each motor revolution.

Compared to the usual radio circuit the wiring diagram of the Minute Motor is a joy to behold and can be completed with a couple of passes of the soldering iron. As shown in Fig. 1, the motor and the 115 vac receptacle are wired in parallel and connected to an extension cord of suitable length. Care should be used in insulating the connections in order to avoid accidental contact with the 115 vac circuit.

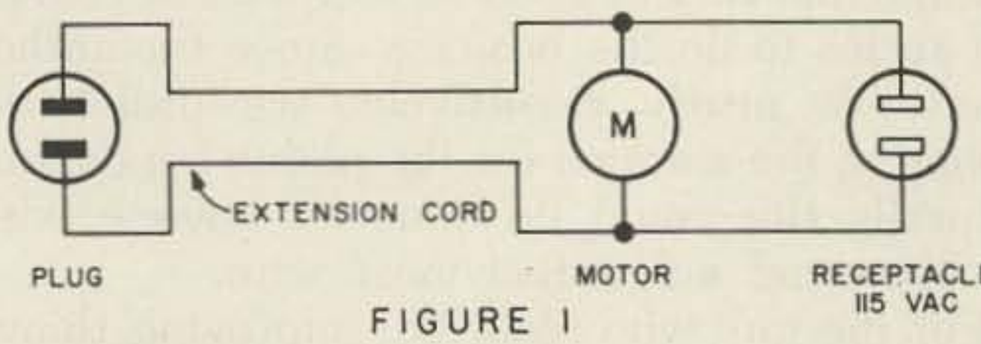
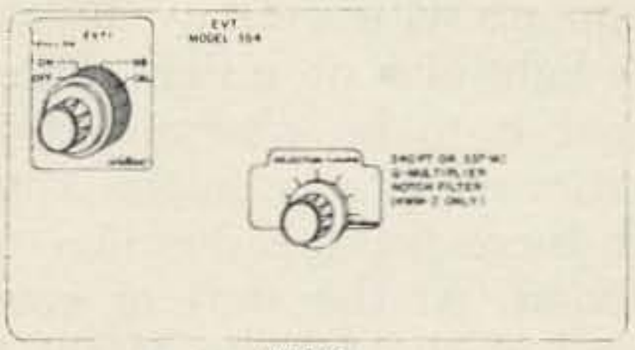


FIGURE 1

No dimensional information is given here because the component parts of the Minute Motor are made in a great number of sizes and shapes. The size of the chassis and the arrangement of parts will also depend on the size of motor and timer used. The manner of connecting the counter to the motor may have to be changed from that described herein as

(after watering, turn page)



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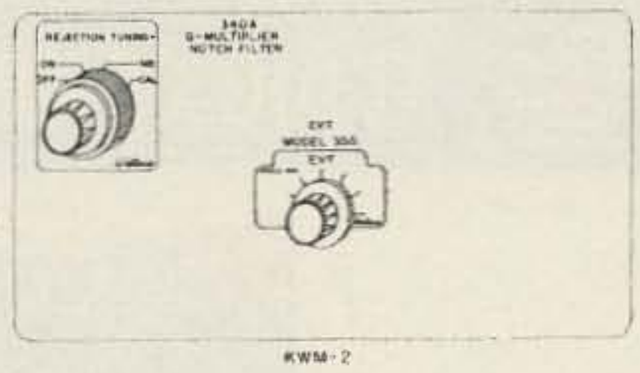

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The Model 354 mounts, **without** drilling front panel, coaxially with "ON-OFF-NB-CAL Switch."
PRICE: **$23.95**

MODEL 355—for KWM-2, **without WATERS** Q-Multiplier/Notch Filters.
for KWM-2, when equipped **with** WATERS 340-A Q-Multiplier/Notch Filter.
The Model 355 mounts on front panel above Band Selector Swtich.
PRICE: **$21.95**

NOTES: 1) The Model 355 will NOT fit KWM-2A.
2) On KWM-2A **only,** it is not feasible to mount BOTH EVT and Q-Multiplier/Notch Filter on front panel.

Both Model 354 and 355 EVT come complete with all hardware, matching escutcheon plates, knobs and WATERS "EZ DO" instruction and Installation Books.

For KWM-2(A): 340-A
No holes to drill.

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For all Collins Rec. & Xcvrs.
For 75S-1: 337-S1A

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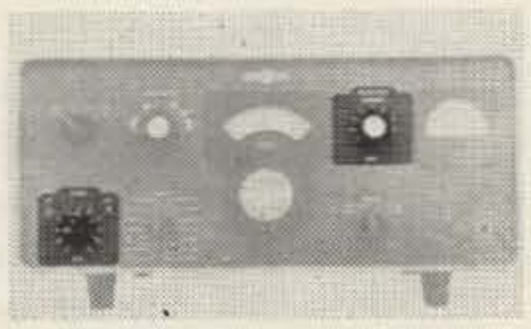

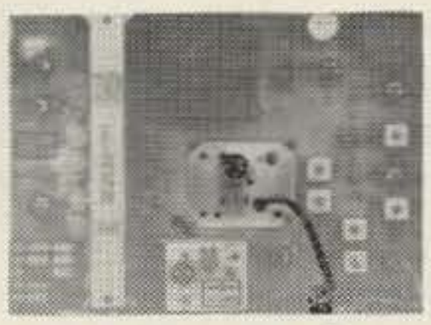

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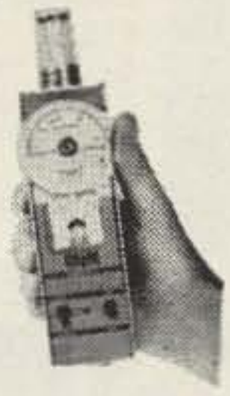

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HIGH IMPEDANCE threshold is set at —52 DB and will provide up to 50 DB of compression with negligable distortion. LOW IMPEDANCE threshold is set at —25 DB, and will provide up to 40 DB of compression when used between the speaker and the audio output of a receiver; resulting in excellent AVC action from receivers with poor RF AVC characteristics.

MODEL AFC-1 (3" x 3" x 5") requires an external power source (often available from transmitter or receiver) and contains a 90-3500 cycle bandpass audio filter.

MODEL AFC-2 (5" x 5" x 7") has a built-in power supply and a switch controlled BROAD-MEDIUM-SHARP audio filter.

MODEL AFC-2CW is identical to the AFC-2 except for much sharper audio filters. It is intended for use with filter type exciters and for CW reception when used in the speaker line of receivers.

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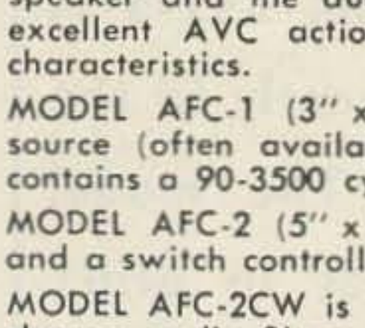

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some counters operate with a reciprocating action while others operate with a rotary action.

In use, the bench light or a drop light under which the equipment is to be constructed is plugged into the outlet receptacle on the Minute Motor and left there for the duration of the construction period. At the start of each work session the cord of the Minute Motor is plugged into the 115 vac source. During the time the cord of the Minute Motor is plugged into the 115 vac source the bench light will be on and the counter will be registering the number of revolutions of the motor. Although not used on the original Minute Motor, a toggle switch could be wired into the circuit which would eliminate the necessity of inserting and removing the plug for each work session.

At the start of a project a record is made of the number appearing in the window of the counter and this number when subtracted from the number appearing at the finish of the project will give the total number of motor revolutions made during the project. Of course, for the counter to tell a true story, the bench light which is plugged into the Minute Motor cannot be used for other purposes, and the Minute Motor, itself, must be unplugged when no work is being done on the project.

The Haydon timing motors, or similar motors of other makes are made with various speed outputs, from one revolution per fraction of a minute to one revolution per day and even slower. The motor used in the Minute Motor has a speed of one RPM, and in use, an increase of one number on the counter represents one minute of elapsed time. At the start of a project a record is made of the number appearing on the counter. This number subtracted from the number appearing at the finish of the project represents the total elapsed time in minutes, which, in turn, divided by 60 will give the time in hours and minutes.

The Minute Motor was first used on the assembly of a well known transmitter kit. The counter showed the number 1633 at the start of the work and the number 3628 at the finish. 3628 minus 1633 equals 1995 motor revolutions, or 1995 minutes. This divided by 60 is equal to 33.25 or 33 hours and 15 minutes total construction time. The latest project, the assembly of a ten-meter transceiver kit, using the Minute Motor, required a total of 17 hours and 13 minutes to complete.

The ideal motor for the Minute Motor is one having an output speed of one RPM, but motors with other output speeds are equally suitable and only require one additional step in the computation of total elapsed time. If a

4 RPM motor is used each revolution would advance the counter one number which would represent only a quarter of a minute. To obtain the true elapsed time in minutes the total counter number would have to be divided by four. In the case of a 6 RPM motor, the total counter number would have to be divided by six.

As the counter ordinarily available will return to zero when its highest number is reached it is best to use one with at least four digits displayed in its window in order to avoid going through the zero point more than once on a project. A counter that could be manually reset to zero at the start of each project would be ideal.

The ham constructing and using the Minute Motor will be rewarded with the satisfying knowledge of the exact time required for completion of a project and will not have to rely on a wild guess when questioned by his fellow hams.

In addition to the Minute Motor's use as a construction project timer, it can be used in the power circuit of a piece of equipment to record the total operating time of the equipment. Its use as a time recorder is limited only by the imagination. . . . W3WPV

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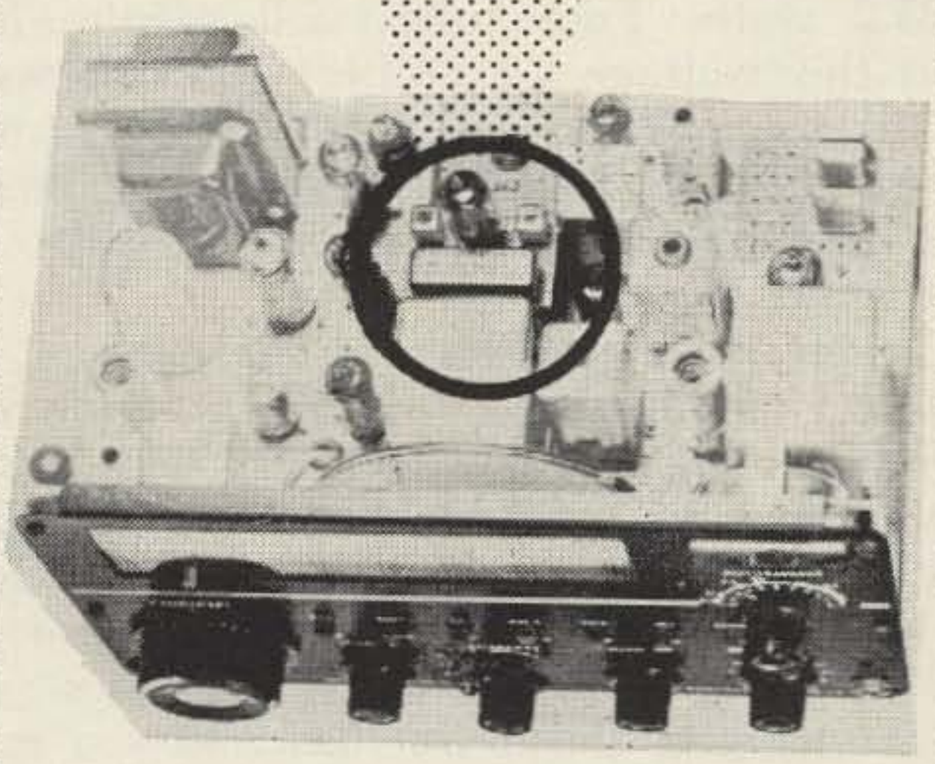

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Are you having trouble finding a suitable filament transformer at what you may consider a reasonable figure for that new final rf amplifier you are building? Offered here is a method of exchanging your time and effort for such a transformer at a very modest cost.

The problem can be resolved in three parts:

1. Determine the wattage requirements for the filament or filaments of the tubes to be used in the amplifier.

2. Find a transformer capable of supplying wattage.

3. Modify and rewind the transformer to supply the proper voltage and current.

As an example of the solution of part one: We plan to construct an rf amplifier using four 811A's. The filament in each 811A requires 4 amps at 6.3 volts. The filament wattage per tube will be 4.0 (amps) x 6.3 (volts) = 25.2 watts. Four tubes will require four times this wattage - 4 (tubes) x 25.2 (watts per tube) = 100.8 watts. Therefore any transformer used to supply the filaments should have a minimum rating of 100.8 watts for continuous service.

The second problem can be solved by visiting your favorite TV dealer or repair man to find out what junked TV sets with power transformers are available for bargaining. You should be able to pick up the transformer alone for a buck or less if you remove it from the old TV chassis. If the repair man does your TV servicing or the dealer has sold you some merchandise recently he may give you the complete set.

After you have acquired an old TV power transformer—or before, if you are given a choice of several sets—it is necessary to determine if the transformer has the wattage requirements to handle your tubes. As a first try, look up the manufacturer's specifications on the junker you have selected to determine if its power input requirements (wattage) are equal to or greater than the wattage requirements for the filaments of the tube you plan to use. If it meets this specification you may have found your transformer. If you are unable to find the manufacturer's specifications, look up the set in a Sams or Rider Photo Facts, and in the parts list you should find the wattage of your transformer. Most radio and TV shops have a Radio Master Catalog that may enable you to find your information if only the manufacturer's part number is on the transformer. If no information concerning the transformer you have selected can be found, it depends on how much of a gambler you are whether you wish to use it or not. It is advisable to select one with a known rating.

After a selection is made, check it over for shorts and that old tattle tale burned smell. Carefully separate all the secondary leads and connect the primary to a fused 117v outlet. If it blows a fuse it may or may not be any good. However, as the primary is all that needs to be good, proceed with caution if it blew the fuse.

Assuming the primary has tested good, we can proceed to the third part. The modification may also be broken down into parts: 1. Factors that must be known: the voltage and current required from the secondary. 2. The numbers of turns of wire to supply the voltage required. 3. The size of the wire required to carry the filament current. 4. The actual rewinding.

The voltage and current requirements for the tube or tubes can be found in the spec sheet on the tube or the ARRL Handbook. The number of turns of wire to be used on the secondary can easily be found by using the following advanced mathematical gyrations. Count the number of turns on the transformer that are used on the six volt and/or five volt winding and divide the number of turns by their respective voltages. The resultant is the turns per volt for that particular transformer.

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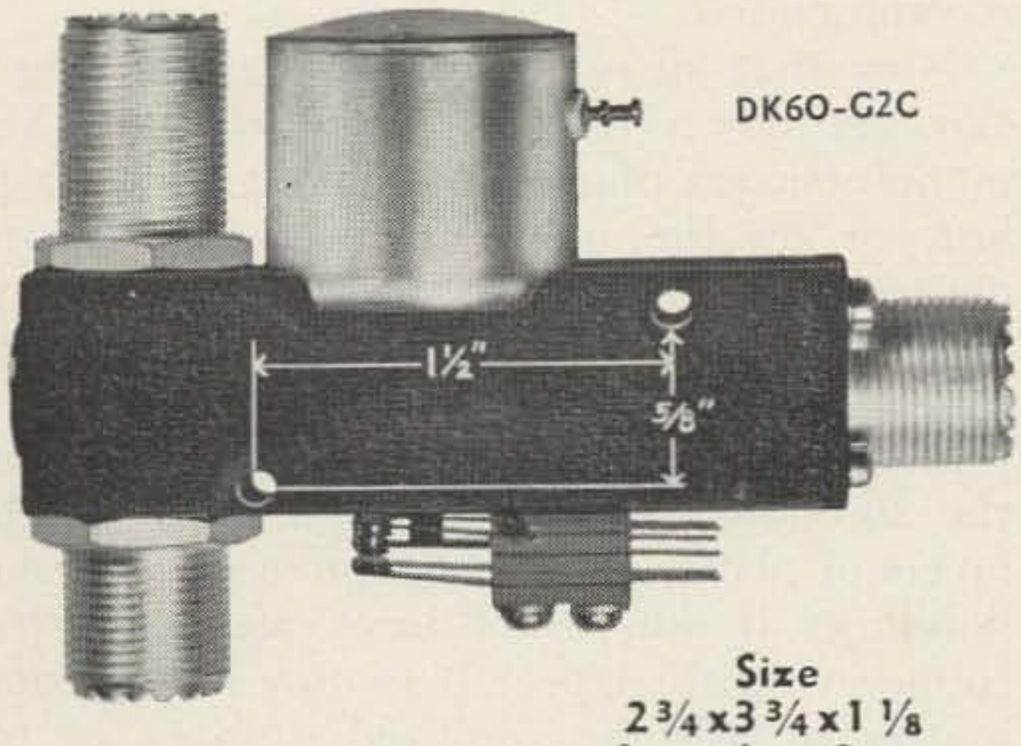
DK60 SERIES

COAXIAL RELAYS



DK60-G2C

Size
2¾ x 3¾ x 1⅛
Less than 9 oz.,

4 VERSATILE MODELS, AC or DC
UHF, N, BNC, TNC or C CONNECTORS

(Also industrial and military requirements modified and built to specifications)

COIL RATINGS: 6, 12, 24, 28, 32, 48, 110 and 220 V DC @ 2 watts. 6, 12, 24, 110 and 220 V AC @ 6 VA, 50-60 cps. Special coil voltages available on request. Coil terminals are solder connections feed-through insulators.

r.f. RATINGS: 1 kw power rating to 500mc. 20 watt power rating to 500 mc in DK60-G and DK60-G2C in de-energized position. The DK60-G and DK-60-G2C have a special isolation connector in the de-energized position to reduce crosstalk to a minimum.

AUXILIARY CONTACTS: Form 2C (DPDT) on DK60-2C and DK60-G2C, Bifurcated contacts rated at 5 amperes at 110 V AC non-inductive.

VSWR: Less than 1.15:1 from 0 to 500 mc (50 ohm load). 72 ohm relays available.

ISOLATION: Greater than 60 db @ 10 mc in DK60 and DK60-2C. Greater than 100 db from 0 to 500 mc in DK60-G and DK60-G2C when in the energized position.

OPERATING TIME: Less than 30 milliseconds from application of coil voltage; less than 15 milliseconds between contacts.

DK60

DK60-G

DK60-2C

DK60-G2C

STANDARD RELAYS WITH TYPE UHF CONNECTORS INCLUDE:

DK60—SPDT r.f. switch. $12.45

DK60-G
SPDT r.f. switch with special isolation" connector in deenergized position. $13.70

DK60-2C
SPDT r.f. switch with DPDT auxiliary contacts. $14.35

DK60-G2C
SPDT r.f. switch with DPDT auxiliary contacts and special "isolation" connector in deenergized position. $15.65

- ★ Relays available in weatherproof boxes for exterior installation.
- ★ Ganged, multiple position switch arrangement available for remote control selection of antennas.
- ★ Unconditional guarantee for period of one year. (We will repair if faulty within one year.)

DOW-KEY DK2-60 DPDT r.f. SWITCH

FOR SWITCHING TWO COAXIAL LINES SIMULTANEOUSLY!

Size: 2¾" x 3¾" x 1¾"
Wt. Less than 12 oz.

NEW DK2-60B TRANSFER SWITCH

Designed to meet switching needs when using transceiver as exciter to drive any linear amplifier.

Performs necessary switching to either transmit directly with transceiver or to transmit with transceiver amplifier combination.

SPECIFICATIONS: Freq. range 0 to 500 mc. to 1 kw; VSWR 1.15:1; Isolation 30 db at 500 mc, 50 db at 30 mc; Insertion loss 0.03 db at 30 mc; Available in all std. AC and DC voltages. Connectors: UHF std., type N, BNC, TNC and C available.

DK2-60 or DK2-60B, UHF Connectors. . . . $19.00

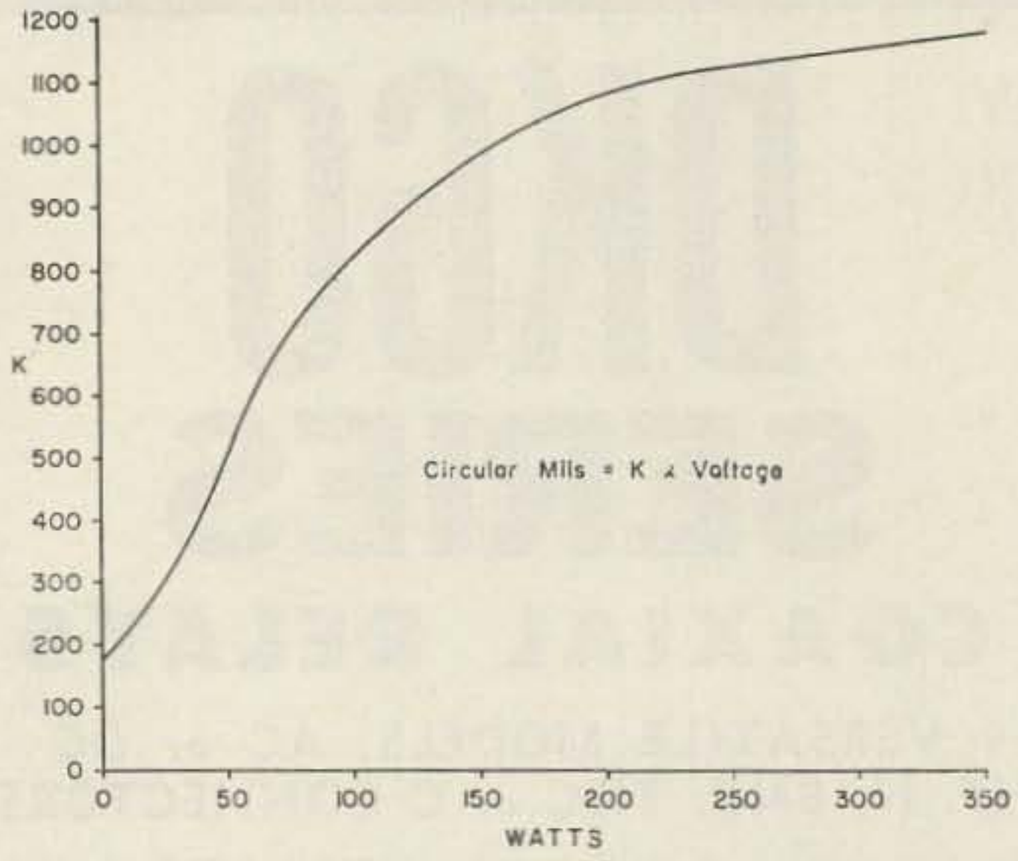
DK71 SINGLE POLE SIX THROW MULTI-POSITION SWITCH

DK71 with UHF Connector **$49.50**

LOW VSWR: Less than 1.1:1 at 100 mc; Crosstalk: greater than 45 db at 100 mc: 1 kw power rating, connectors: UHF std., N, BNC, TNC and C extra; 50 ohm impedance; weatherproof; Continuous duty, over 1 million operations. Standard AC, DC operating voltages.

See any one of our 700 Dealers and Distributors in U. S. and Canada for catalog sheets or write:

Manufactured by DOW-KEY COMPANY, Thief River Falls, Minnesota



The manufacturer has probably done a good job in obtaining this figure, so take his word for it. All that is necessary to do now is to multiply your desired voltage by the turns per volt ratio, and presto the total number of turns for the secondary are found.

Now for the bug-a-boo that seems to rip everyone up . . . what SIZE wire to use. The current carrying capacity of a wire is directly proportional to its cross-sectional area, however, conditions under which the wire functions will add a multiplier to this statement so that no hard fast rule can be made that guarantees that a wire size will carry so many amperes. The reason for this is predicated upon the wire's ability to dissipate generated heat under its operating conditions. For example, you would expect a wire in open air (such as a utility line) to dissipate its heat better than the same size wire (with length the same) coiled and encased in a transformer. Therefore, a larger wire will have to be used in a transformer than one used in open air conditions to carry the same voltage and current. The size wire to be used is determined by the wattage and type of operations. By referring to Fig. 1, a value K can be determined for the particular wattage that the transformer is to handle. This value K multiplied by the filament voltage is equal to the necessary circular mils value of the wire to be used. For example–let's use the four 811A's again–they required 6.3 volts and 100.8 watts. Looking on the chart we find one hundred watts, go up to the curve and across to a K value of about 820. Multiply 820 x 6.3 = 5166.0 circular mils. From the wire tables we find that #14 solid copper wire has a circular mil cross section of 4107.0 and #13 has 5178.0. Size #13 is almost on the nose, however it has been found that most motor rewind shops only stock even sizes of wire, so it may be necessary to go to the next even size larger or in this case #12. Size #12 wire has a cross sectional area of 6530.0 circular mils and would probably operate slightly cooler. (It must be remembered that the larger the wire, the smaller the number of the wire.) A good grade of enameled copper wire, such as used in motor rewinding, is recommended.

Now that all of the paper work is over we can get down to the rewinding job. Many manufacturers place the secondary winding on last, or on the outside, making it a simple matter to cut through the secondary layers with a hack saw and remove them in a short time. Be careful and avoid cutting into the primary unless you plan to rewind it too. After the secondary is removed, place about three layers of plastic electrical tape over the primary windings if you don't have access to transformer varnish paper. It is now only a simple matter to fish the required number of turns through the transformer windows (this procedure is recommended if only the filament secondary is to be rewound). Be careful not to scrape the enamel from the wire on the sharp edge of the transformer's core–and pull them tight. Leave the leads long–you can always cut them off later.

There are two schools of thought on obtaining the secondary center tap: 1. Count the number of turns, divide by two, and tap on to the wire; 2. Wind two secondaries with each equal to one half the required voltage. I prefer the latter, as you can easily be assured of a correct center tap. (If this method is used, be careful to wind both secondaries in the same direction.)

Check your work, and if it meets with your approval connect the primary to the power line and measure the secondary voltage. It will probably be higher than calculated, but you can expect it to drop when the tubes place a load on it. If the voltage is within 10-15% of the calculated value, connect the tubes to the transformer and check the voltage under load. If the voltage is too low, add a half turn or so until the voltage is correct. The reverse would be true if the voltage is too high. This should not be necessary if the above procedure was properly followed.

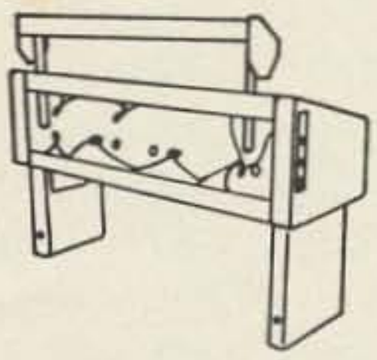
Place enough plastic tape over the winding to hold it firmly in place, and the job is finished. If there is a case for the transformer, slip a good grade of spaghetti over each of the protruding wires.

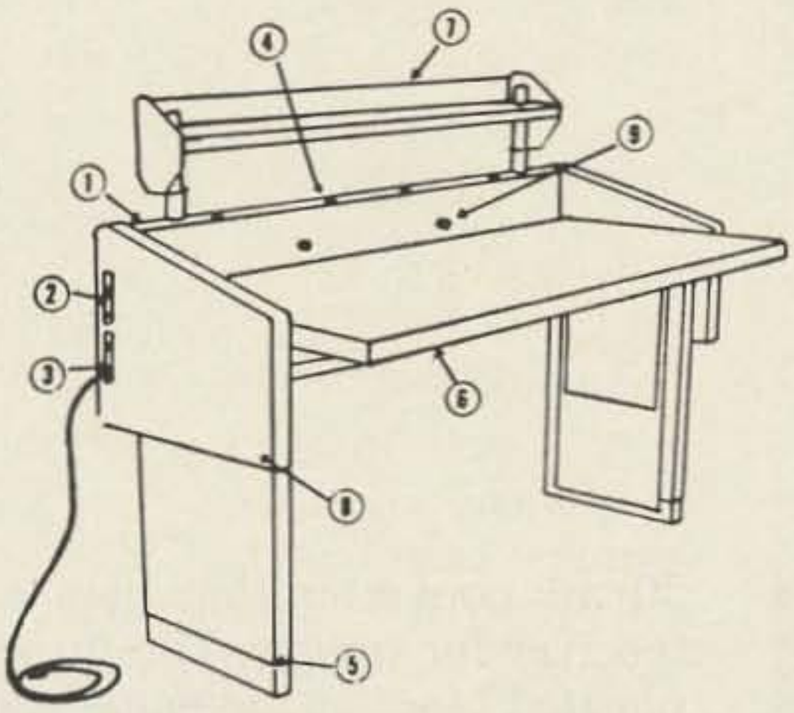
I believe you'll find that this "poor-boy" transformer will not take a back seat to any of the commercial grades and you can't buy the experience you will have gained in rewinding it! Good Luck!

. . . W5VOH

NEW! A PRE-ENGINEERED HAM EQUIPMENT CENTER WITH BUILT-IN POWER & COMMUNICATION FACILITIES

Bring the ham center up out of the cellar—let the whole family share in the fascinating world opened up by global communications. The handsome styling of this functional unit fits well in any decor—neatly organizes equipment and cables.





Standard $99.95

Deluxe $139.95

DELUXE STATION FACILITY . . . complete with formica top, vinyl trimmed ends, shelf and all electrical and mechanical features listed above. Approx. shipping weight 190 lbs. F.O.B. BROCKTON, MASS.
Part number 5203-2DSFA AMATEUR NET only $139.95.
STANDARD STATION FACILITY OR WORK BENCH . . . complete with standard steel ends, masonite top, and all applicable features as described above. Approx. shipping weight 160 lbs. F.O.B. BROCKTON, MASS.
Part number 5203-2SSFA AMATEUR NET only $99.95.
Order direct from factory or write to customer department for additional information.

ALDEN PRODUCTS COMPANY
5186 N. MAIN ST., BROCKTON, MASS.

OUTSTANDING FEATURES—

1. UNIQUE power channel safely encloses all interconnecting wiring, relays, etc. Eliminates "rat's-nest" behind equipment. Room for built-in power supply, filter network, etc.
2. CONVENIENT "big switch" with indicating fuseholder and neon pilot light—additional individually controlled and fused circuit switches may be added.
3. THREE wire detachable line cord brings in all power—insures proper grounding.
4. POWER channel has eight 110-volt outlets—4 above top and 4 below top—with grounding contact—eliminates makeshift outlet strips or adapters.
5. COMFORTABLE operating position—legs are adjustable to suit your individual needs—casters may be added for portability.
6. MASSIVE 1¾" thick top 26" x 60" provides ample room for transmitter, receiver, VFO, amplifier, etc. Deluxe top is white formica—standard is masonite.
7. ADJUSTABLE shelf, standard on deluxe model, holds test, monitoring or other equipment convenient to operator.
8. END panel covers removable—provide additional storage area for tools, tubes, etc.
9. DELUXE model equipped with 3 SO-239 RF antenna lead connectors.
10. EASILY assembled with ½" wrench and screwdriver—all screws removable with coin.
11. PLEASING appearance will appeal to XYL. Deluxe—two tone gray—gleaming white formica top—vinyl trimmed ends. Standard—gray with brown masonite top.
12. HEAVY gauge bonderized steel construction with baked enamel finish will last a lifetime.

(QLF from page 29)

a Colonel should be addressed, and with a meek, "Yes, Dad," left the Texas station hanging in mid-air and *Pulled The Big Switch*, and *Hit the Sack*. Kids, just don't act that way now, or perhaps it's because I never got above a Second Louie . . .

And will I ever forget the thrill of flying my own plane and at the same time hamming on 5 meters? But by that time there was such a thing as a "store-bought" xmtr rig. So it wasn't too difficult, except that three of us pilot-hams had built everything from scratch and it did work. 50 watts from the plane at 1500 feet, got us *some 5 mile DX!* Today the same 50 watts on 6 gets around the world in a good deal less than 80 milliseconds!

One of the newer deals that really gets my cork out is the gink who "breaks" your qso with some friend with a lot of queer-sounding gibberish supposed to sound like a foreign language. When you say, "breaker identify yourself" you get more of the gibberish with something that sounds like "YK1 ADC calling," etc. And no amount of talk will induce the nut to get back to English or whatever could pass for any known language. This type of idiot should have his license yanked, his tower destroyed and he should be made to send ICW to himself for the rest of his life, "I am a nut" . . .

You can count yourself with a high IQ if you know that: A concerted move is being made by the CB'ers to have at least 6 channels set aside of their bands for frank and open hamming. They call it the pre-ham or sub-ham bands. This will be the first inroad into hamdon where *NO operators' licenses will be required!* They feel that with 250,000 prospective "votes" the FCC cannot say them nay. Also there is a move on foot to get the CB'ers to use SSB!

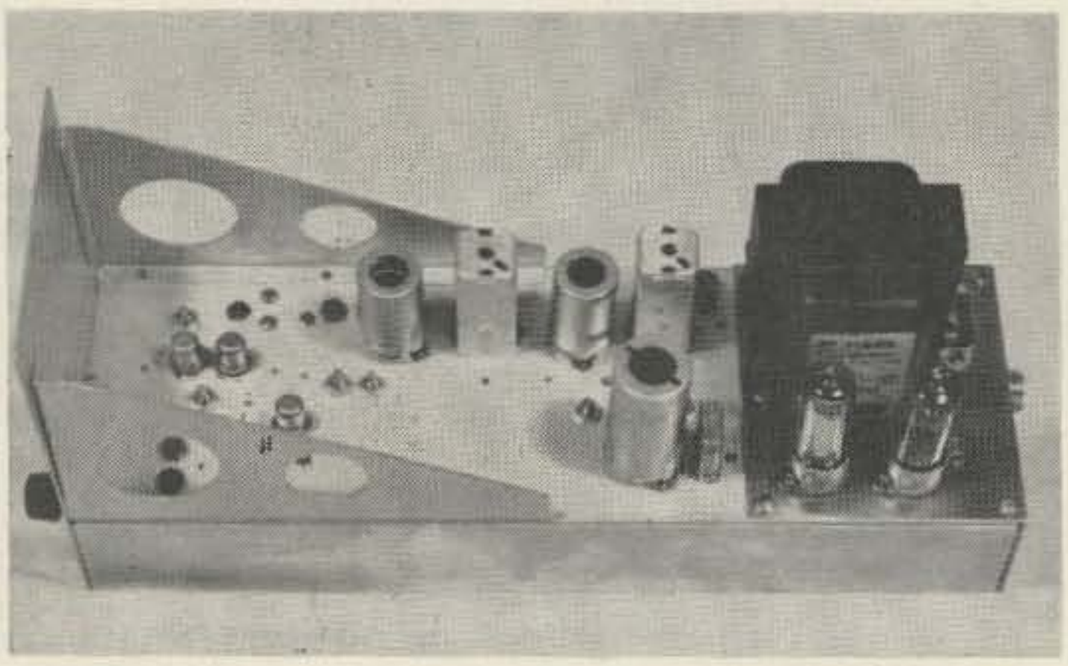
You are really smart if you have heard the move on foot by some manufacturers to obtain a permit for the use of 4000 watts PEP by the hams. They are after an FCC interpretation which would permit this, as if there isn't enough power in the ham bands right now. And you can work out only if you stay out of "Kilowatt Row" on the usual 80-40 and 20-meter bands . . .

QLF (a term born over 50 years ago with spark) stands for "Send with your left foot, you lug!" . . . K9AQJ

144mc Nuvistor Converter

John Wonsowicz W9DUT
4227 N. Oriole Ave.
Norridge 34, Illinois

Photos by: Howie Trieb K9EPB



Top view of the complete unit showing the converter and the power supply module. The crystal oscillator and trippler tube can be seen in the lower left. The if output is directly above the crystal, next to the second if can.

It seems that more and more manufacturers of electronic devices and a large number of VHF gear home-brewers are taking a shine to circuits using the 6CW4 or similar nuvistors. From data previously published on the excellent performance of this pip-squeak, it's a wonder that the "large-tube" counterpart is still surviving. Of course we can always find room for the big brother, but for pre-amps, converters and VHF front ends, the thimble is it.

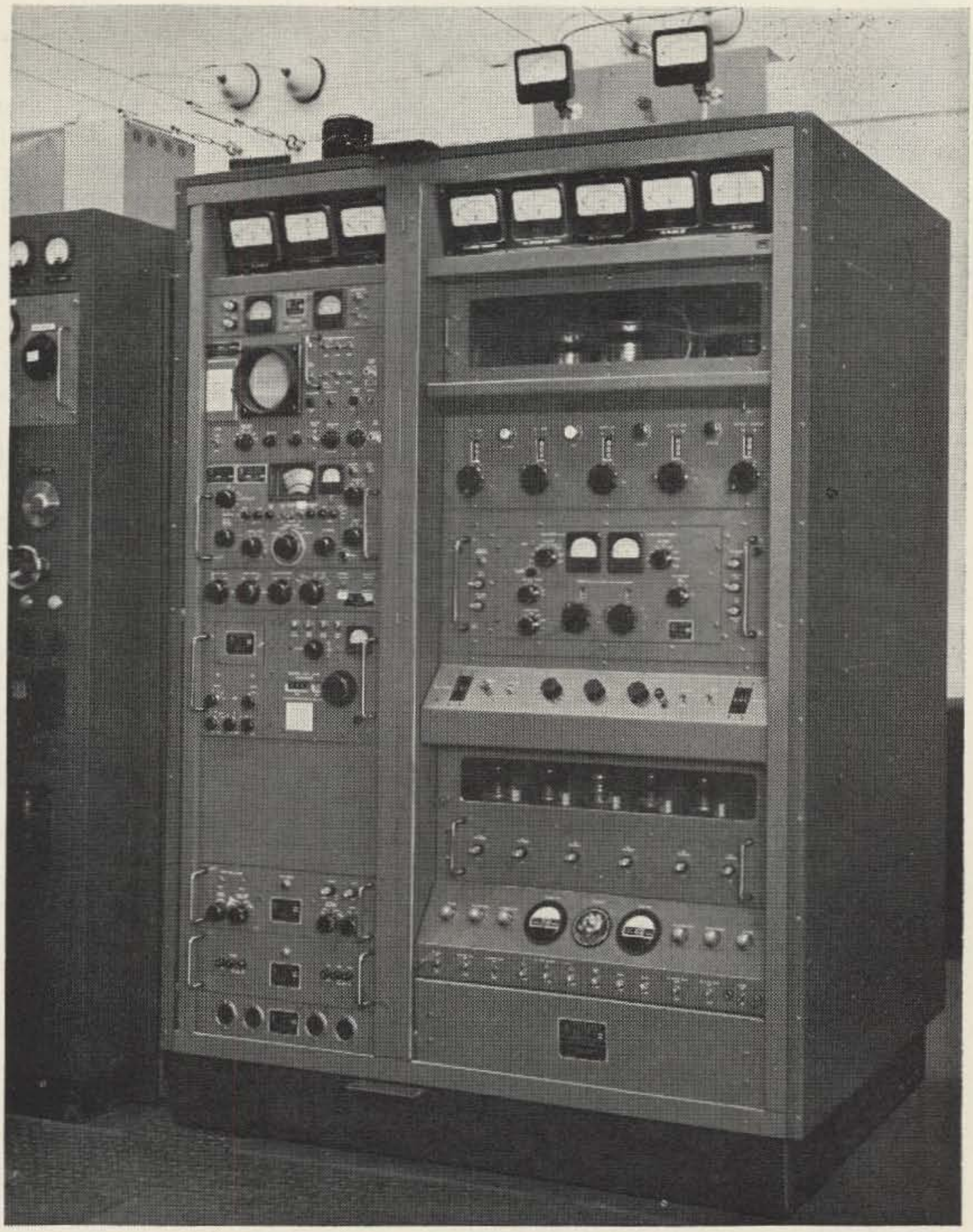
The converter about to be described is the outgrowth of the nuvistor pre-amp published in the March 1963 issue of this magazine which received such wide acceptance, as indicated by the large amount of mail.

This device, which combines the high gain, low noise pre-amp with a crystal controlled converter and a stage of *if* for extra gain, was designed and built as a plug-in unit for a deluxe VHF communication receiver now in process of construction. However, the converter can be used with any 6 meter receiver or fed into any 50 mc converter that uses a lower frequency receiver for tuning. The project is not too complicated for an average do-it-yourself man handy with a soldering iron and requires only a few evenings of time to put it in orbit with guaranteed satisfaction.

Performance

Evaluation of performance on the points of sensitivity, noise figure, gain and bandwidth is as follows: The sensitivity when coupled to an average receiver will be in the order of .1 to .2 microvolts. The noise figure is 3 to 4 db. Gain is at least 50 db. Bandwidth is within 1 db at 148 mc when peaked at 145 mc. Due to a stage of 50 mc *if* built into this unit, the converter can be used with low gain, poor

Bottom view of the 144 mc conventer showing arrangement of the components and the brass shields. To extreme left is the power supply module separated from the rf section by the angled T that houses the oscillator and trippler. The larger coil is the oscillator coil and the smaller diameter coil is the trippler. The link coupling connected by the twisted lead runs through the angled shield to the mixer coil. Adjacent to the mixer coil is the plate coil of the 6CW4, and to its lower right is the cathode coil of the same nuvistor.



This TMC GPT-10K has been in continuous service since its installation two years ago.

THE TECHNICAL MATERIEL CORPORATION

10KW SSB TRANSMITTER MOVES INTO PRESS WIRELESS

The Technical Materiel Corporation is proud to join the Press Wireless transmitting family at its overseas facility in Centereach, Long Island.

Press Wireless, famous for providing overseas communications services for over 25 years, has recently installed the TMC GPT-10K Sideband Transmitter, as shown in the above illustration.

For complete details of the GPT-10K Transmitter request Technical Bulletin 1008.

THE TECHNICAL MATERIEL CORPORATION
MAMARONECK, NEW YORK

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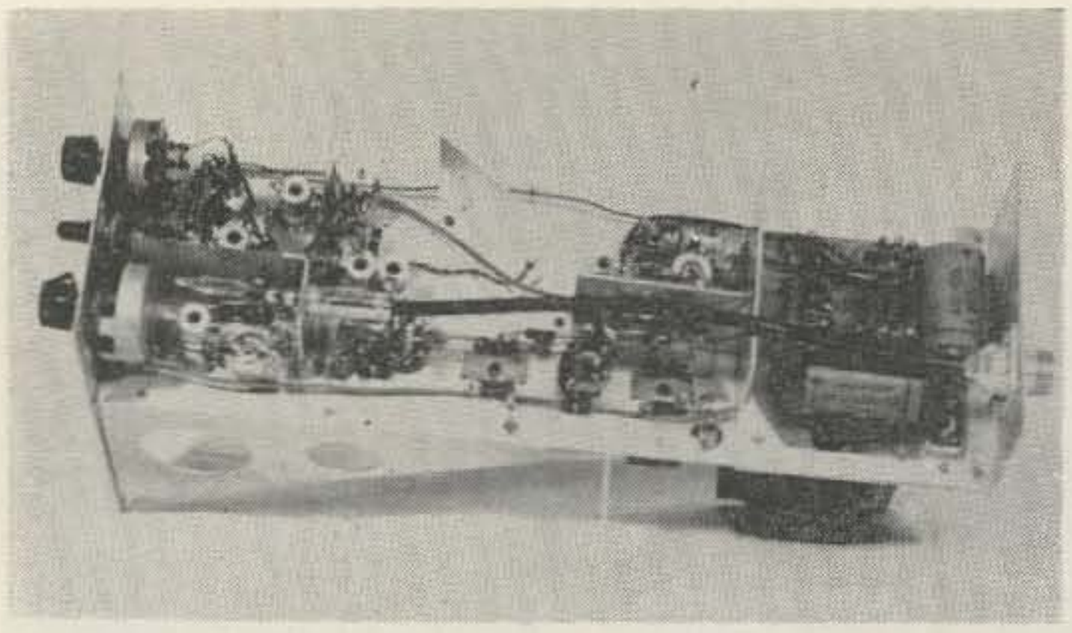


Bottom view showing the rf gain control and the input cathode coil compartment. The NE 2 switch bulb can be seen just above the cathode coli. The ceramic CI capacitor is fastened to the chassis by two ¼" spacers and 4-40 screws and nuts. Coil just above the NE 2 is the plate coil of the tandem nuvistors of the first rf stage. The angled shield separates it from the cathode coil of the next stage.

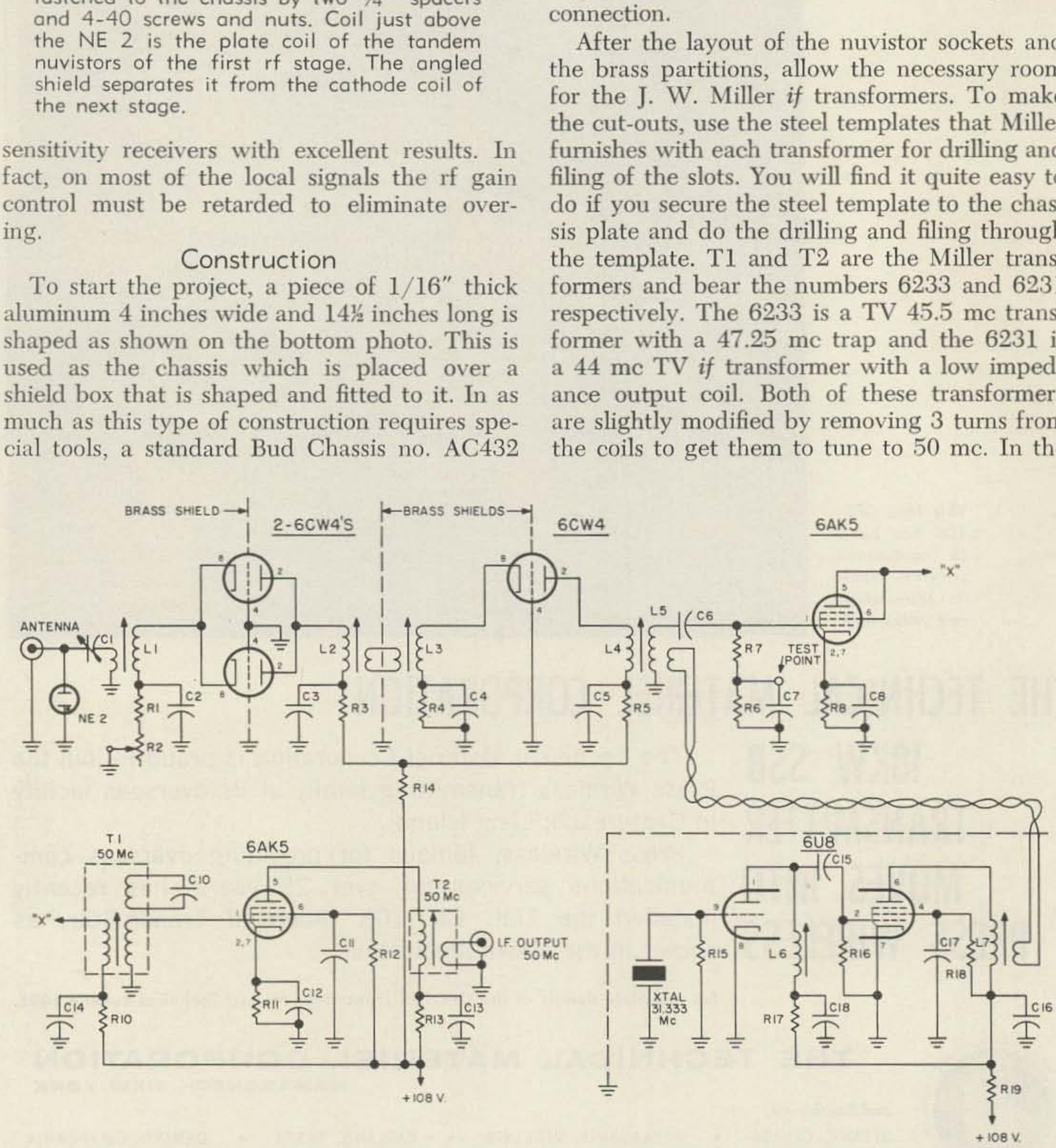
sensitivity receivers with excellent results. In fact, on most of the local signals the rf gain control must be retarded to eliminate overing.

Construction

To start the project, a piece of 1/16" thick aluminum 4 inches wide and 14½ inches long is shaped as shown on the bottom photo. This is used as the chassis which is placed over a shield box that is shaped and fitted to it. In as much as this type of construction requires special tools, a standard Bud Chassis no. AC432 which measures 3" x 17" x 4" can be used. However, use the chassis as the shield only and fasten the bottom aluminum plate to it for drilling and mechanical aligning and then use the plate as the converter chassis. It is much easier to wire components and fit the brass partition coil shields on a plate chassis than the standard 3" deep chassis and it looks as good.

Arrange the rf components on the front part of the plate, as shown on the photos, bearing in mind the space necessary for the brass partitions which are shaped as an L and fastened by 2-56 screws to the aluminum chassis plate. Upon completion of the wiring, the brass shields can be tack-soldered for better ground connection.

After the layout of the nuvistor sockets and the brass partitions, allow the necessary room for the J. W. Miller *if* transformers. To make the cut-outs, use the steel templates that Miller furnishes with each transformer for drilling and filing of the slots. You will find it quite easy to do if you secure the steel template to the chassis plate and do the drilling and filing through the template. T1 and T2 are the Miller transformers and bear the numbers 6233 and 6231 respectively. The 6233 is a TV 45.5 mc transformer with a 47.25 mc trap and the 6231 is a 44 mc TV *if* transformer with a low impedance output coil. Both of these transformers are slightly modified by removing 3 turns from the coils to get them to tune to 50 mc. In the



144 Mc. NUVISTOR CONVERTER

MARS CONTROL CONSOLE
$57.50

The Mars Control Console contains in one unit a Kilowatt SWR Bridge measuring both 52 or 75 ohms—Hybrid phone patch—Internal speaker with provision to switch to external speaker if desired, plus several switches for control of xmttr, receiver, etc. as desired. All this at an amazing low price.

MARS MOBILE TRANSMITTER
$59.50

The popular MARS Mobile re-appears in a new dress and improved design. Bandswitching 75-40 with 18 watts input and plenty of good audio. Measures only 3½ x 5 x 7. Switches to either 6 or 12 volt operation. Requires 300 volts at 150 mills. Completely wired ready to operate less crystal mike and power supply.

PAUSAN COMPANY **SAN RAFAEL CALIF.**

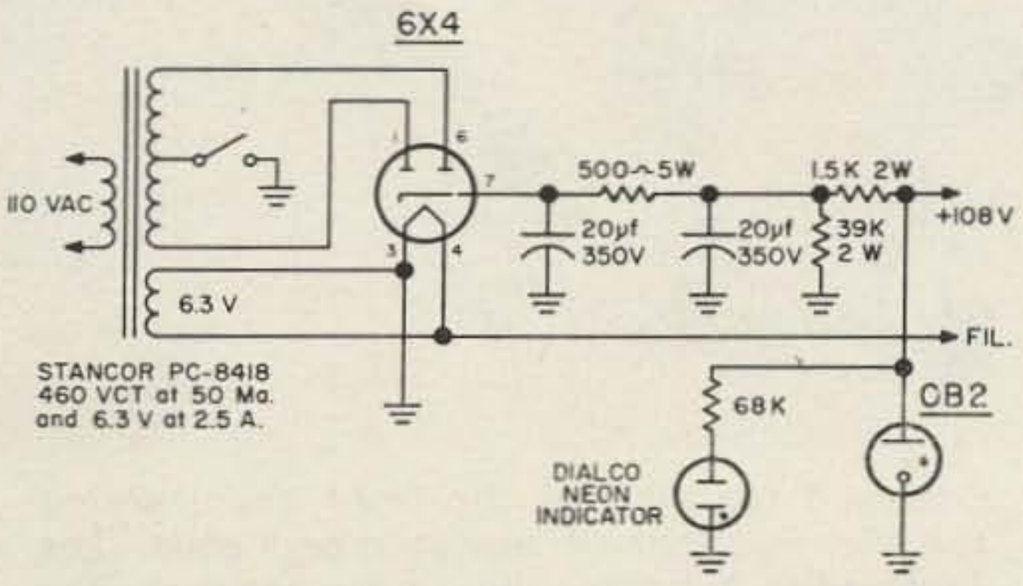
6233 transformer, the 47.25 mc trap can be utilized by shunting it with a 50 mmfd capacitor to trap out the third overtone crystal frequency of the converter oscillator from feeding through and giving false beats.

In the unit shown, a cut-out of 3½" x 3" was made to accommodate the power supply module. Although such construction is ideal if you have the extra time, it is not essential to performance of this unit. The power supply can be built on the rear part of the chassis plate with or without the OB2 regulator tube.

The bottom view of the photo shows the wide separation between the rf and mixer coils and the oscillator coils. This is good practice since the only injection to the mixer is through the link coupling, thereby eliminating capacity pickup of spurious beats.

The neon lite shunting the antenna is a simple electronic switch which shorts out the input to the converter in case of excessive rf in the antenna relay during transmission periods. It also discharges the build-up static in the antenna during storms.

The front panel and associated components



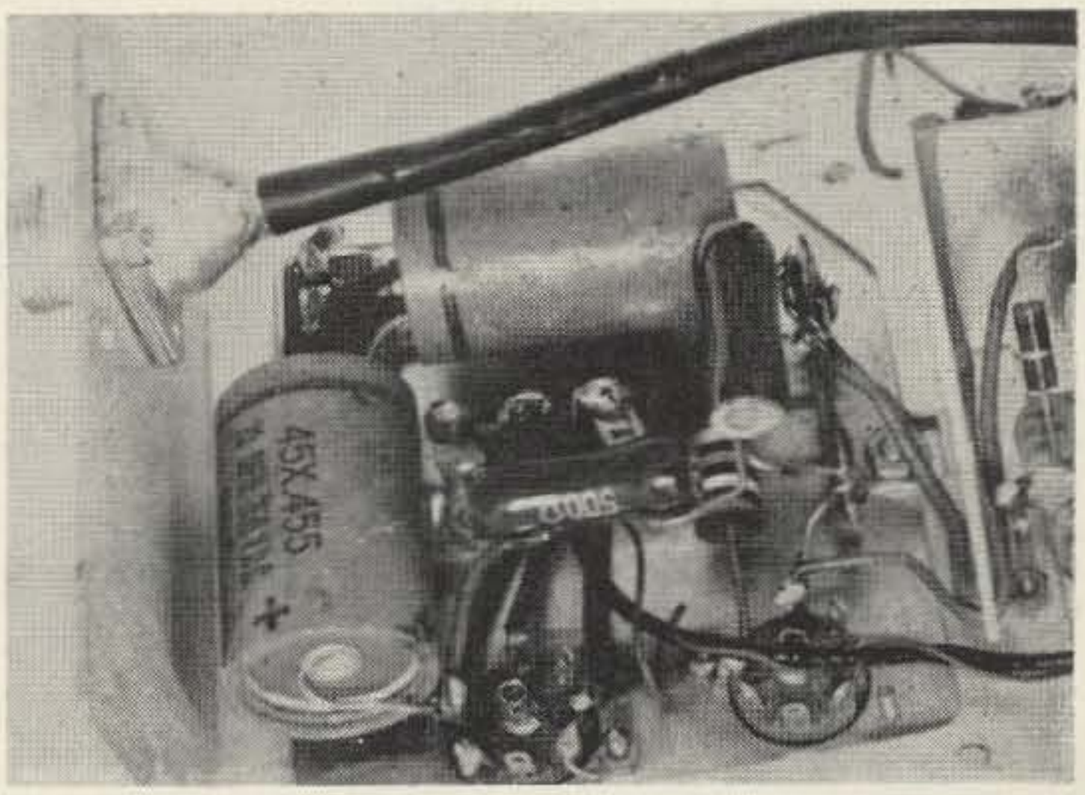
POWER SUPPLY FOR 144 Mc NUVISTOR CONVERTER

can be left out. In this unit they are a part of a plug-in module of a receiver and constructed to add rigidity to this module.

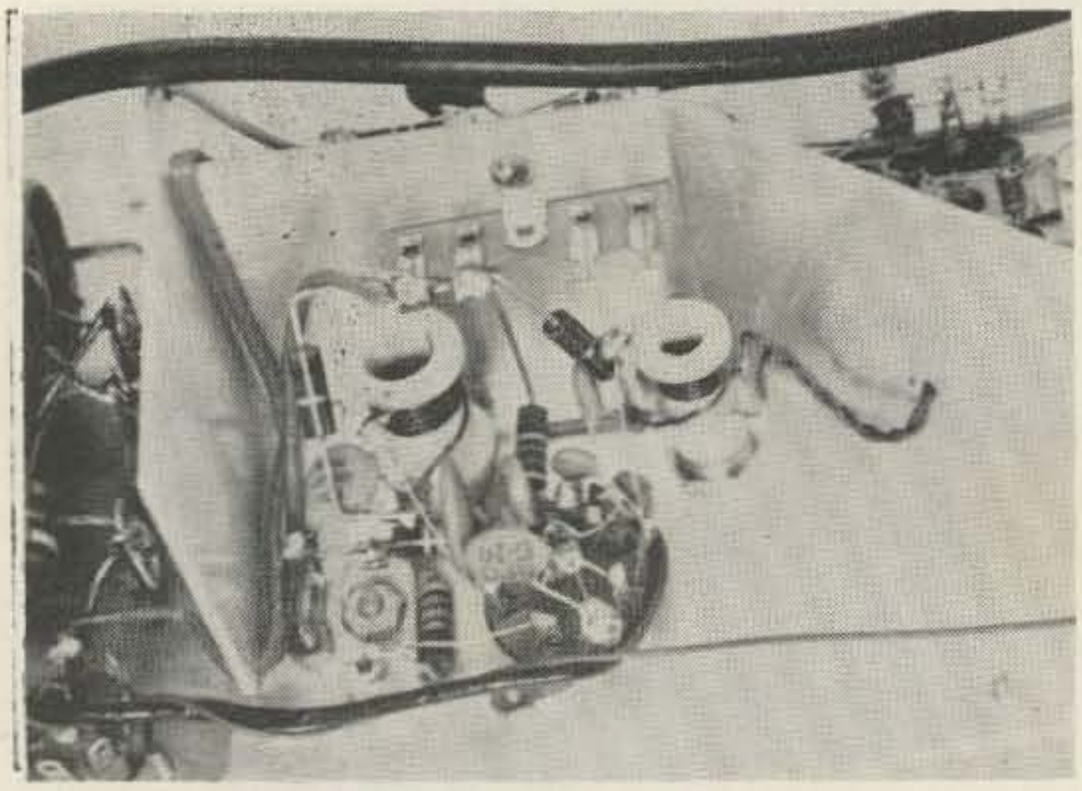
Electrical

The modification of rf ceramic coils which carry a Miller no. 41A000CB1 was detailed in the March issue article on "Nuvistor Pre-amp." I might add that J. W. Miller furnishes several extra wire tabs with each coil at no extra charge, making such modifications easier.

If you follow the schematic wiring diagram and make up the coils as per coil data, no trouble will be encountered in the final peaking. The rest of the wiring is rather simple. With the aid of a small soldering iron, connections to the 6CW4 sockets and the link coupling tabs should be easy. The necessary pre-



Bottom view of the power supply module showing arrangement of components. The coax connector is placed from inside so that a proper length of RG/58 U can be fashioned on the bench before installing.



Oscillator compartment showing arrangement of components. By-pass capacitor leads are as short as practical for arrangement and soldering.

caution to take in all VHF items is very close by-passing. Cut the lead of the by-pass capacitor as close as possible and return it to the brass shield. Use a bigger soldering iron when soldering to the shield.

After all soldering is completed, take a few minutes and check over all connections for cold solder joints and at the same time check the wiring against the schematic. With this out of the way, start the tuning of the unit.

Tuning

The tuning of the converter is performed in a way ordinarily used in aligning pre-amps and converters. For those that have never attempted to set their converter to the proper portion of the band, proceed with the simplest of all methods—the grid dipper. First, dip all your coils in the rf section to the proper frequencies. L1 through L5 are dipped at 144 mc. L6 is dipped to the crystal frequency of 31.333 mc and L7 is dipped to the third harmonic of this frequency, making it resonant at 94 mc. These coils can be dipped and pruned before completion, but with the tubes in place and no power applied. To eliminate false frequency dipping, a good practice to follow is to ground all the coils first with a jumper wire, then disconnect the jumper on the coil to be dipped and set it to frequency with the slug. When the right frequency is reached, ground the coil again and then follow through for the rest of the coils in similar manner. Don't forget to disconnect all the jumpers when dipping is completed.

The modified Miller transformers no. 6233 and 6231 will be close enough to 50 mc with the removed turns on the coils, so nothing is done to them until the final touch-up.

After the front end is dipped and the unit completely wired, connect it to the antenna and a 50 mc receiver or converter and proceed with the final adjustments with power applied.

Tune in a station or use your grid dipper as a signal and adjust the 50 mc *if* for highest gain. Next, touch up all tuned circuits for maximum gain except L1 and C1. These two components should be adjusted back and forth until the unit displays a minimum of background noise. At this point the signal will appear to be the cleanest, with only slight background hiss. In order to get the best bandwidth it is necessary to use a good signal generator and a VTVM or a sweep generator and an oscilloscope. However, most operators will be com-

Coil Data

L1—4T #26 Bare Space wound one wire diameter 3T Link on cold end.
L2 4T #26 Bare Space wound 3T Link on cold end
L3 4T #26 Bare Space wound 3T Link on cold end
L4 5T #26 Bare Space wound no link (close to L5)
L5 4T #26 Bare Space wound 3T Link on cold end
L6 6T #26 enamel close wound 3T Link on cold end
L7 8T #26 enamel close wound no link ⅜" coil form
All coil forms are J. W. Miller ceramic forms
L1 = through L6 are no. 41A000CBI
L7 = is No. 42A000CBI

I.F. Transformers

T1 is J. W. Miller No. 6233 TV 45.5 mc modified as per article for 50 mc operation
T2 is J. W. Miller 6231 TV 44 mc modified for 50 mc operation.

Capacitors

C1 = Ceramic Trimmer 7-45 mmf. Centralab 822-BN
C2, C3, C4, C5, C7, 8, 16, 17 = 470 mmf R.M.C. discaps

C6 = 33 mmf NPO RMC discap
C11, C12, C13, C14, C18 = 1000 mmf RMC Discaps
C10, C15 = 50 mmf NPO RMC Discap

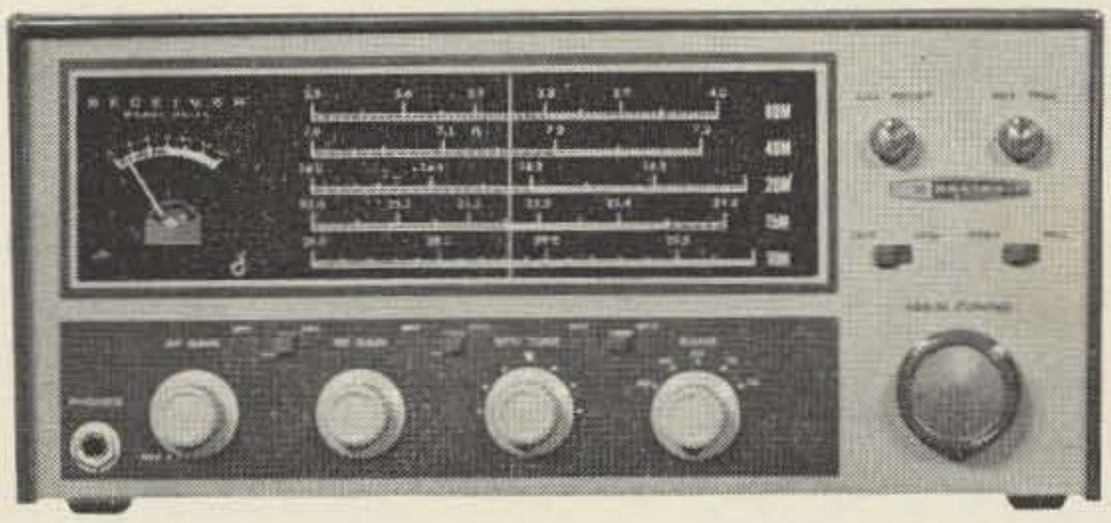
Resistors

R1, R4, R8, R11 = 100 Ω ½ Watt
R2 = 5K W.W. POT
R3, R5, R10, R13, R17, R19 = 1000 Ω ½ W.
R12, R15, R18 = 47000 Ω ½ W.
R7, R16 = 470 K ½ W.
R6 = 100 K ½ W.
R14 = 10 K 1 W.
Note: C9 and R9 in the schematic have been eliminated.

Enlarged top view of the front end showing the arrangement of nuvistor and coils. The first large tube in the upper right is the 6AK5 mixer.

start right stay right with HEATHKIT

Here's the low cost, high quality set-up you need to begin your new hobby of Amateur Radio . . .



HR-10 RECEIVER

• Covers 80 through 10 meters • Tunes SSB, AM & CW signals • Prebuilt, prealigned tuning assembly • RF stage for extra sensitivity • Lattice-type crystal filter for high selectivity

An ideal novice receiver! Easy to build with preassembled, aligned tuning unit, and precut, cabled wiring harness! Versatile controls, large slide-rule dial, built-in "S" meter for easy tuning, built-in BFO for SSB & CW reception and a host of other high performance features to delight any amateur radio fan! Features amateur band coverage only for maximum accuracy and stability. Provision for plug-in 100 kc crystal calibrator. 7-tube superheterodyne circuit. A perfect style & performance mate to the DX-60 Phone & CW Transmitter!

Kit HR-10...20 lbs....$8 mo... **$79.95**

Kit HRA-10-1, Plug-in 100 kc crystal calibrator. 1 lb..... **$8.95**

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• 80 through 2 meters coverage • Plugs into DX-60 for general class operation • A tremendous savings over crystals for similar coverage

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DX-60 TRANSMITTER

• 90-watts phone or CW on 80 through 10 meters • Neutralized 6146 final amplifier • Built-in low pass filter • Operates at reduced power for novice operation

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Kit DX-60...24 lbs.... $8 mo..... **$79.95**

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Specially designed for CW work! Efficient circuitry provides 50-watt plate power input for outstanding amateur communications. Covers 80 through 10 meters. Features built-in low pass filter, neutralized final amplifier, switched antenna relay power, pi-network output coupling and panel meter. Husky built-in power supply. Single knob bandswitching.

Kit HX-11...18 lbs....$5 mo..... **$43.50**

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pletely satisfied with just peaking the converter in the 145 mc range and leaving it there. The attenuation of the signal will be only 1 db at 148 mc, and that's practically a flat response.

It is needless to say that a converter built as described will give you excellent service in all VHF departments, i.e. sensitivity, bandwidth, gain and low noise figure. But the only sure way to satisfy yourself is to compare it with other home-brew and commercial jobs and be the judge. You will grin a grin of pride and satisfaction.

The Portable HE-35

Charles Green W3IKH
17 Little Lane
Levittown, Pa.

Fig. 1.

Now, those of you who are familiar with the HE-35 are looking at the front panel views of Fig. 1 and Fig. 2, and saying "There ain't no such animule." To those others who are not . . . the meter and the control knobs around it don't come with the HE-35.

To explain . . .

My vocation requires frequent traveling and my avocation is hamming. After many evenings in dreary hotels away from home and the ham shack, the thought of a portable rig seemed like a way to combine both my avocation and vocation.

Since most of my traveling is by air, the rig had to be both small and lightweight. Also one of the higher frequency ham bands had to be used, because of antenna space limitations in a hotel room.

The Lafayette HE-35 filled my requirements. It is small (10⅝" L x 5" H x 6¾" D) and lightweight (11lbs.). I also found that I would fit into a photographic gadget bag (Fig. 1), with room for xtals and other things in the pockets. It also seemed like an inconspicuous way to carry a transceiver into a hotel.

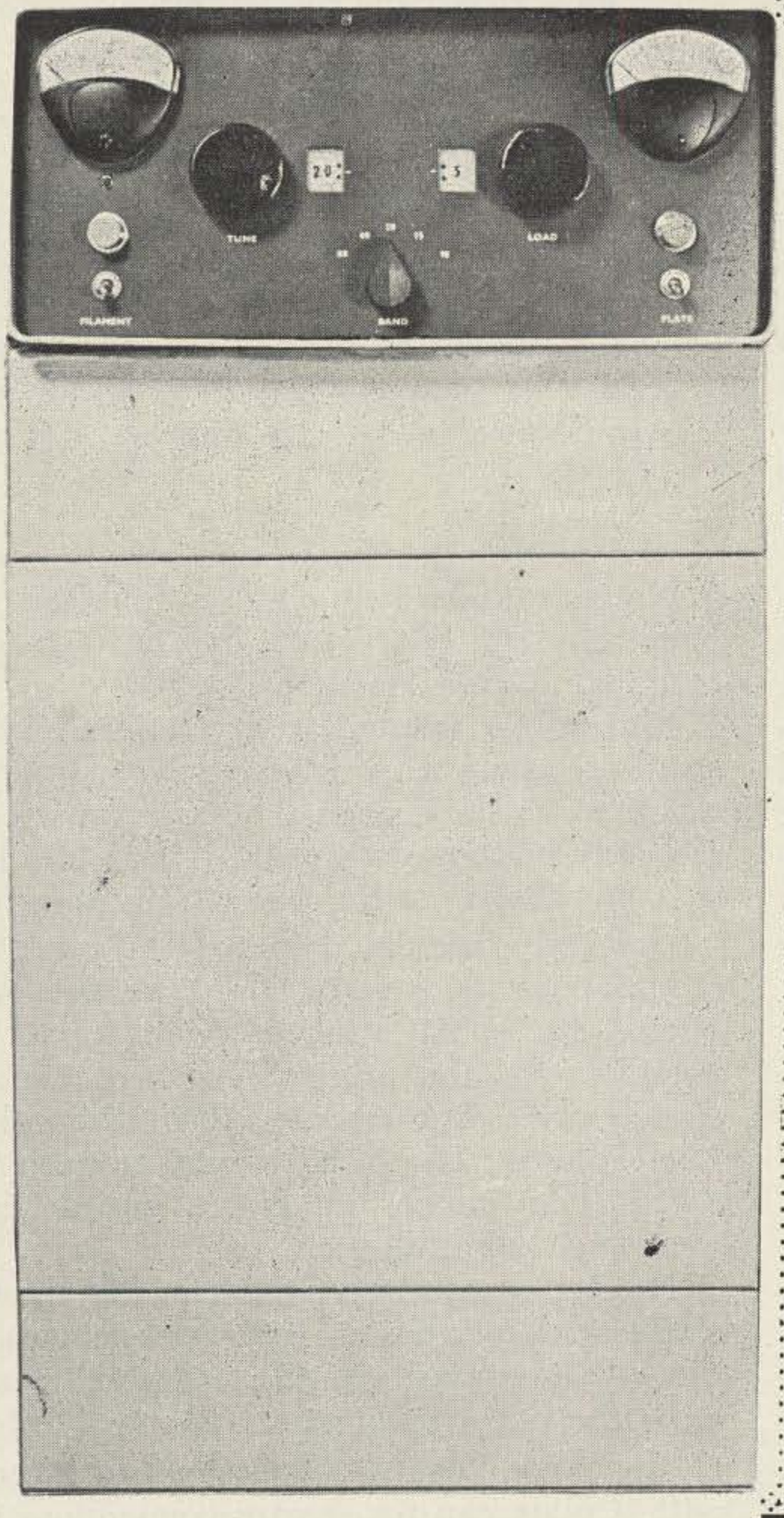
After purchasing the HE-35, I realized that a field strength meter was also needed for tuning up. Since this would require more space and weight if separate, I decided to put a panel mounted plate current meter into the rig for tuning up the transmitter.

The Lafayette TM-403, a 100 mil. panel meter, matched the front panel very well. I removed the pilot lamp on the upper right part of the front panel. Then, using a fly-cutter, I mounted the meter. I also removed the phono jack used as a mike input and mounted a standard Amphenol 75-PC1M chassis connector instead.

The Rubicon had been crossed, there was now no turning back. Once I had started modifying the HE-35, I couldn't stop . . .

Fig. 2.

Introducing



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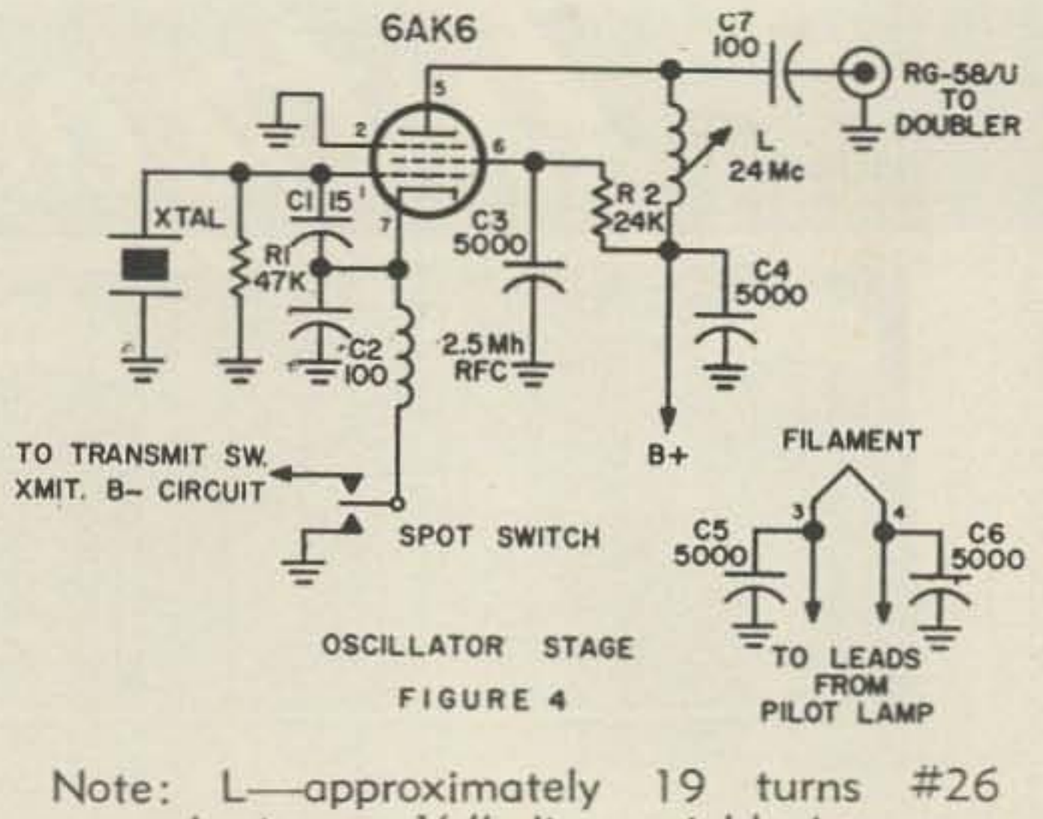
The overtone xtal oscillator circuit was next. I preferred to use 8 mc rocks instead of the more expensive overtone variety.

The pilot light that was removed when the plate current meter was installed used a #47 lamp. The #47 lamp draws .15 amps and is part of the series-parallel heater circuit (Fig. 3). In order to keep the heater circuits balanced, I used a 6AK6, which draws .15 amps of heater current, for the 8 mc oscillator tube.

The oscillator stage (Fig. 4) was built on a small piece of aluminum and fastened to the front panel, alongside the panel meter, with two phillips head machine screws as in Fig. 5 and Fig. 6. Heater connections were made to a terminal strip, mounted just below the panel meter (Fig. 6), to which the former pilot lamp leads had been connected.

An xtal socket for the FT-243 8 mc crystals was mounted in place of the former overtone xtal socket. Also, a spot switch, of the push type, momentary contact, spdt variety (Lafayette MS-449) was mounted on the front panel above the xtal oscillator chassis (Fig. 4).

A grid dip meter was used to resonate the oscillator plate coil to aproximately 24 mc, with the tubes inserted and the RG-58 lead connected to the triode section of the original 6CX8 tube (which acted as a doubler stage.). Note: the coil data given in Fig. 4 is for the modified doubler stage of Fig. 7.



OSCILLATOR STAGE

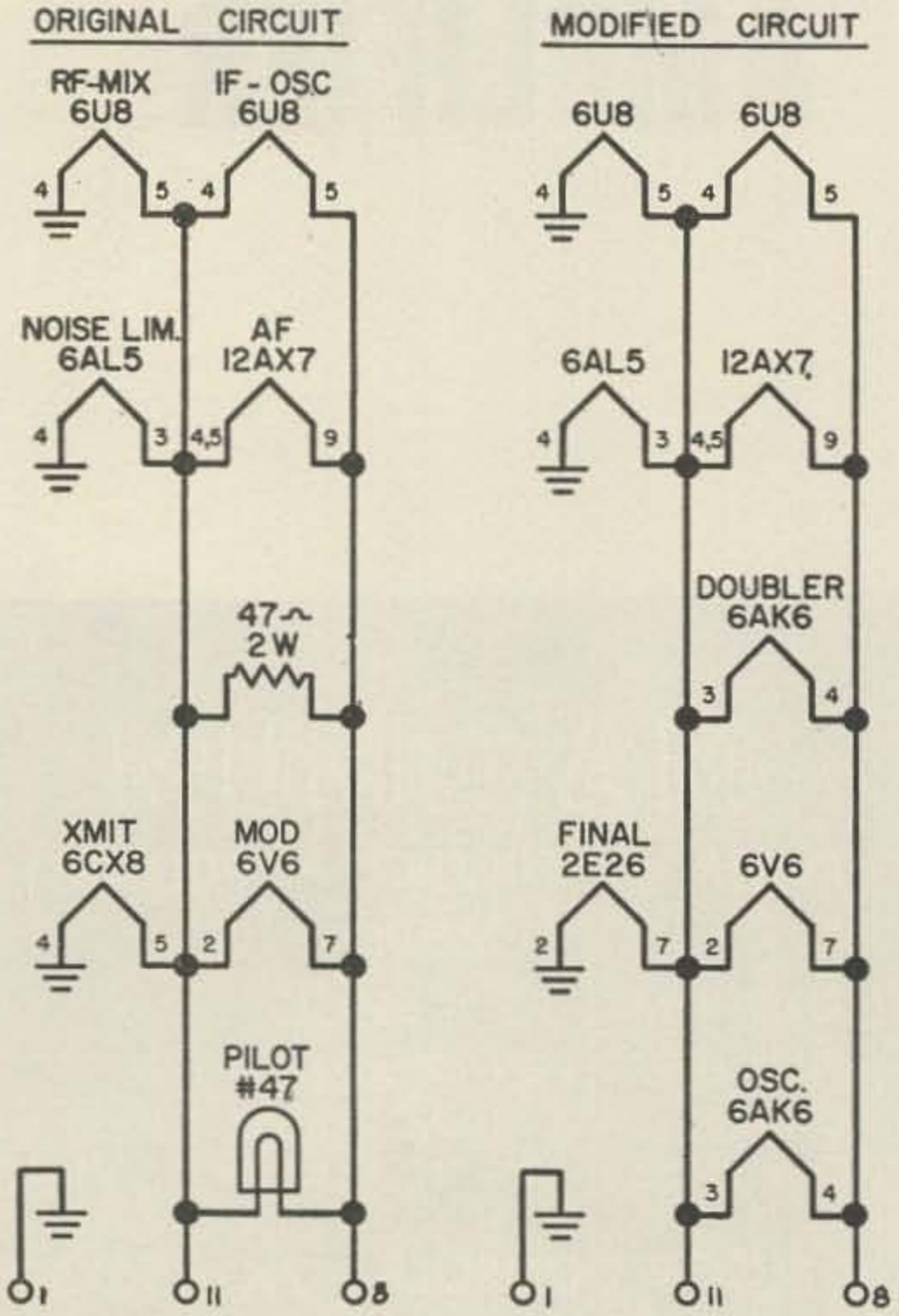
FIGURE 4

Note: L—approximately 19 turns #26 enamel wire on ¼" dia. variable iron core coil form.

Naturally I wanted front panel controls instead of the screwdriver adjust type ones mounted on the chassis. This was my downfall. If I only had known the trials and tribulations that lay ahead, as the old refrain goes.

I cleverly calculated that if the same values of components were used as in the original circuit, the substitution of panel mounted air variables for the original types of capacitors should work. But I forgot about the old devil Lead Length. The 6CX8 went into business for itself. The circuit oscillated merrily and I could not neutralize it.

Having always been suspicious of the use of single ended tubes at high frequencies, with the plate connecting pin rubbing shoulders with the other common tube pins, I thought of the possibility of substituting another tube with a plate cap for shorter connections to the panel mounted variable capacitors. Unfortun-



HEATER CIRCUIT

FIGURE 3

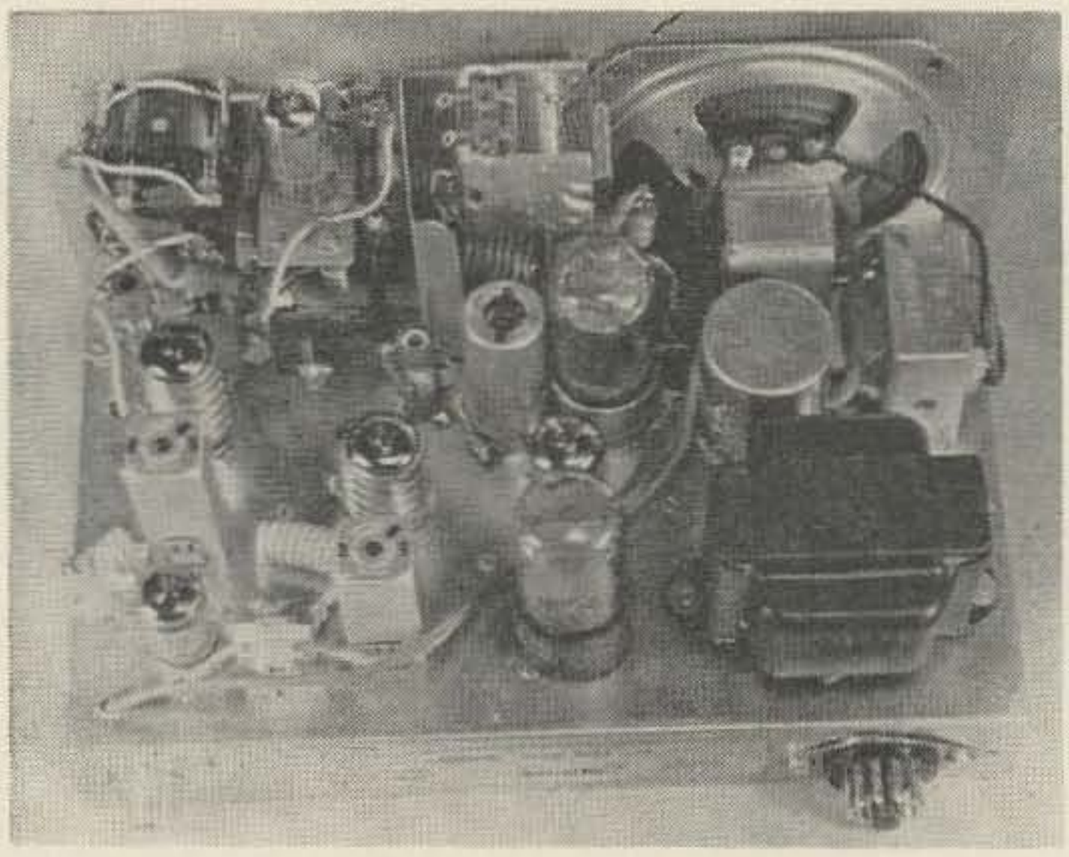


Fig. 5.

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ately a triode-pentode similar to the 6CX8 with a plate cap did not exist. So I had to make two tubes grow where only one had existed before Also the heater currents had to fit in with the master plan (Fig. 3).

I used another 6AK6 as a doubler and a 2E26 for the final. By removing the 47 ohm resistor the heater circuit seemed to balance out pretty well. (Modified circuit of Fig. 3)

With the 6CX8 socket and plate circuit wiring removed and a little fancy work with chassis socket punches, a 7 pin JAN shielded type socket for the 6AK6 and a ceramic octal socket for the 2E26 just squeezed in. The original rf choke was remounted on an insulated solder lug terminal vertically alongside the 2E26 (Fig. 5). The plate tank coil was mounted on a terminal strip close to the plate tuning capacitor. RG-58 was used to run the output from the link secondary winding to the antenna switch section of the relay (Fig. 7).

Fig. 7 is the schematic for the doubler and final circuits. A shielded pair of wires connect the panel meter to the final plate current connections at the rf choke. They pass under the aluminum shield which isolates the final tank coil from the oscillator stage.

The neon lamp originally used as a front panel rf indicator was rewired as in Fig. 7 to serve as a modulator output indicator.

The doubler plate coil (L1, Fig. 7) was resonated at 50 mc with a grid dip meter. All tubes were inserted in their sockets and the power off. Then the coil (L1) was repeaked for maximum output, with the circuit in opera-

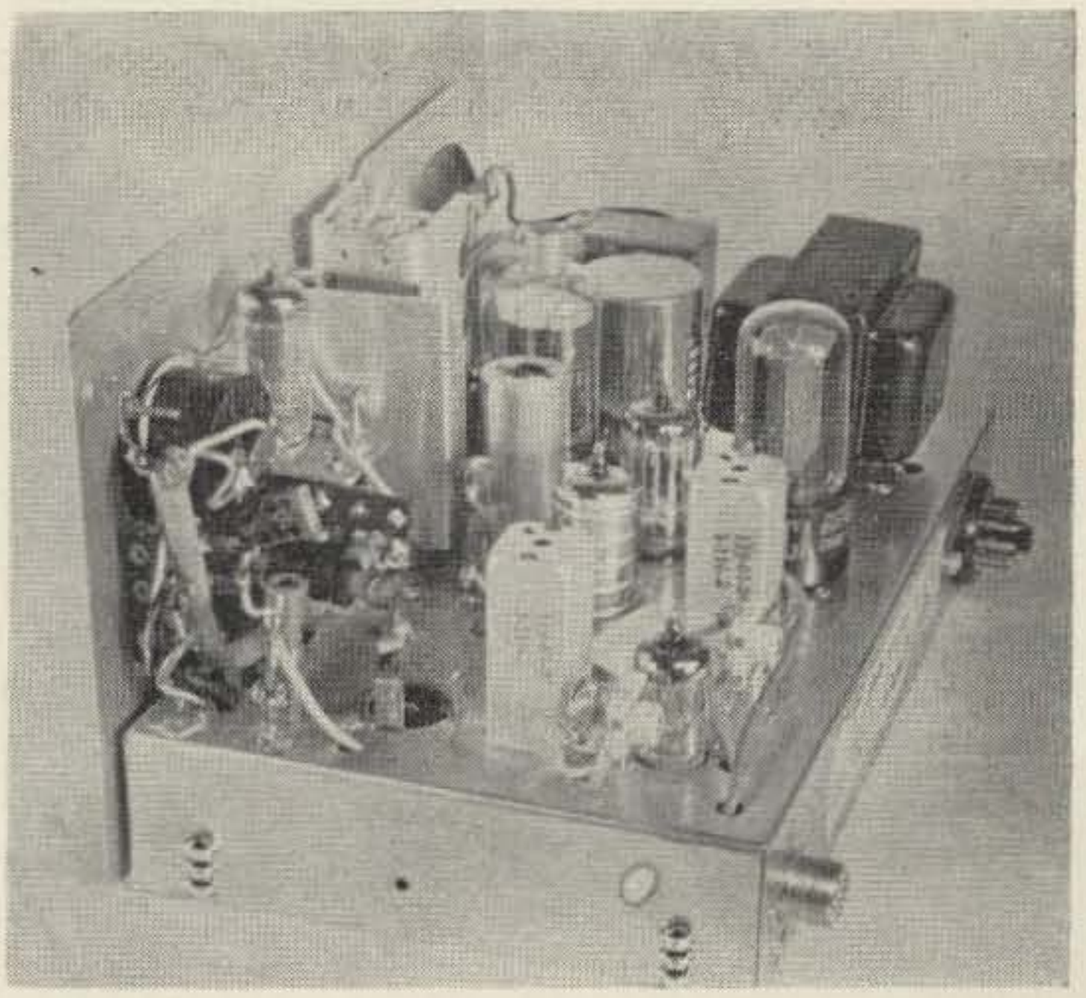
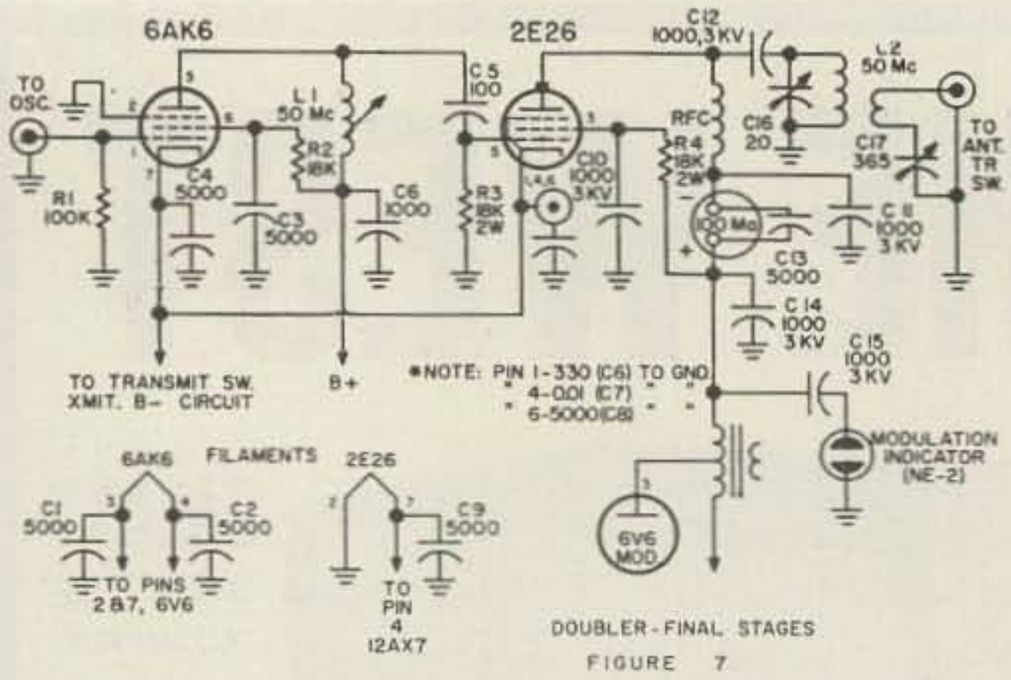


Fig. 6.



DOUBLER-FINAL STAGES

FIGURE 7

Notes: RFC—original component, C16-E.F. Johnson type 20M11, C17-Lafayette type MS-214, L1-ipprox. 7 turns #26 enam. ¼" dia. variable iron core coil form, L2-(pri) 6 turns #12 ½" dia. (sec.) 1 turn insulated wire.

tion, by using the grid dip meter as a detector, and adjusting for maximum reading.

The plate current of the 2E26 will dip to approximately 30 ma at full rf output to the antenna. This is below the normal rated current of 50 ma for the 2E26, but due to the low B+ available it seems to work beter at 30 ma. The 6CX8 also resonated at 30 ma of plate current, so the power input remains about the same.

The receiver was also modified. A small variable capacitor (Johnson 9M11, 9 mmfd) was mounted on the front panel under the plate meter. This allowed a short lead to the grid terminal connection of the antenna coil. By removing the 4700 ohm shunting resistor connected across the coil, the variable capacitor acts as an antenna trimmer capacitor. Weak signals can be peaked up considerably and the front end selectivity is much better.

Both the transmitting and receiving antenna traps were disconnected. This seemed to improve both transmission and reception. While

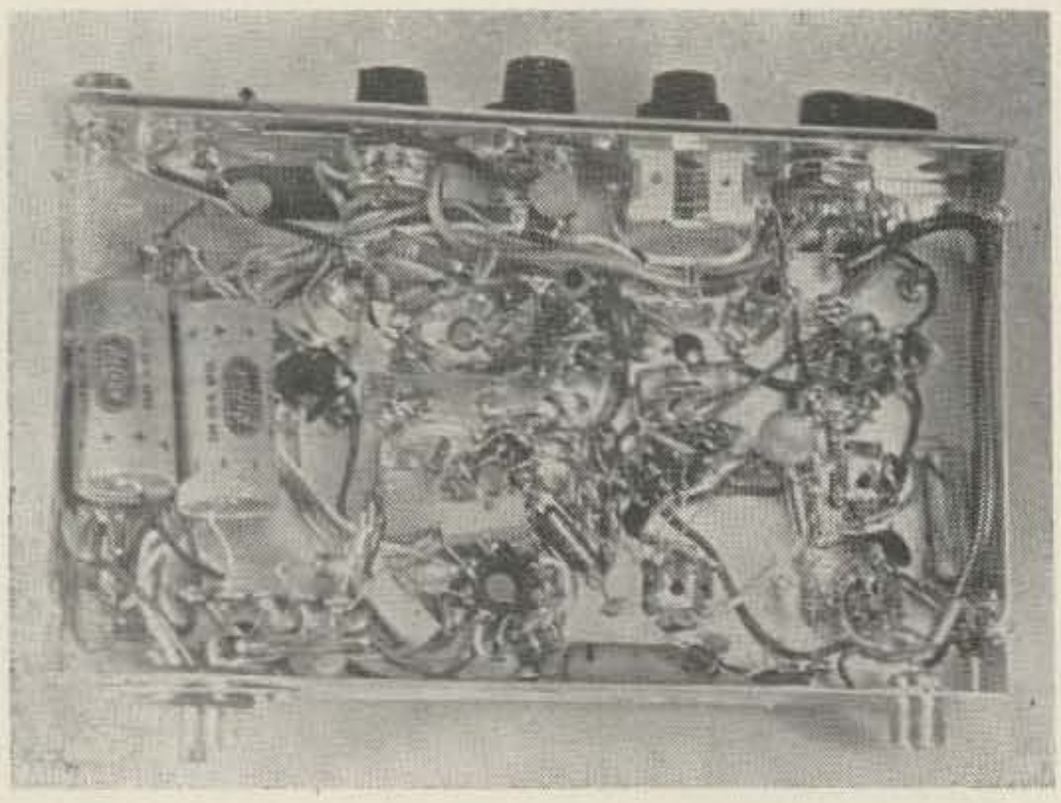
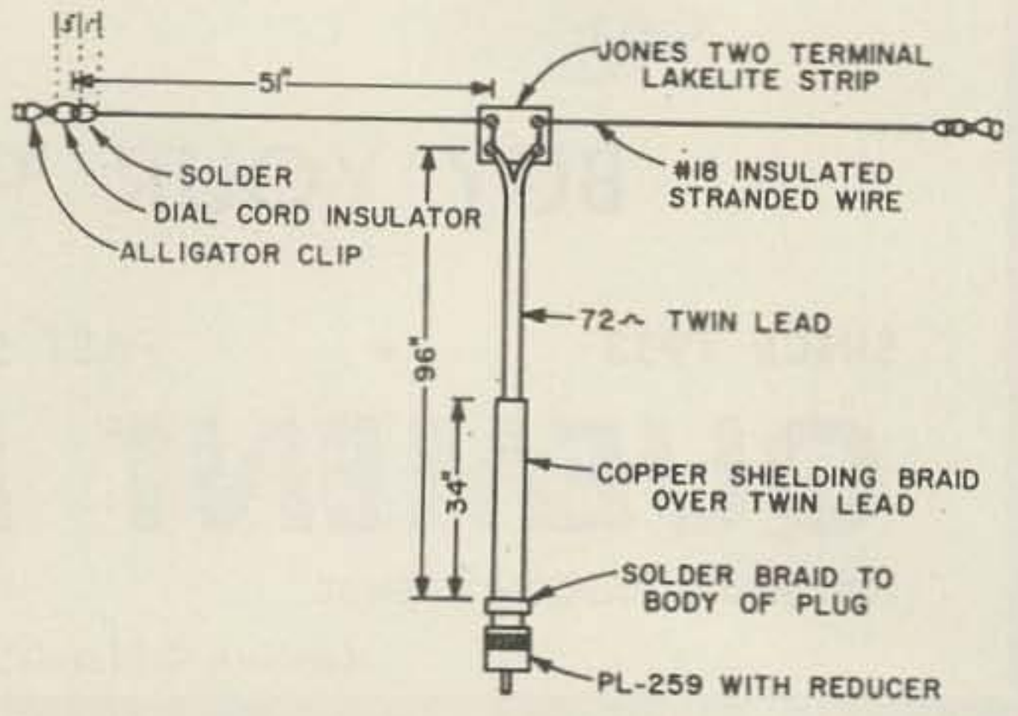


Fig. 8.

receiving weak signals with the gain turned near maximum, I noticed that as I varied the audio control, the receiver detuned. This was traced to inductive pickup from an unshielded wire lead from the transmit switch to the audio gain control. This passed near the solder lug terminal strip to which the receiver tuning capacitor was connected with a 15 mmfd disc capacitor. By replacing the lead to the audio gain control wih a shielded wire, the trouble disappeared.

A pointer of white plastic was cemented to the receiver tuning outer knob and approximate calibrations were scratched between 50 and 51 on the panel dial. After the receiver warms up for a while, the tuning becomes fairly stable.



PORTABLE 6M ANTENNA

FIGURE. 9

A portable 6 meter antenna was made as in Fig. 9. The alligator clips connected to the antenna ends by the dial cord insulators enabled me to set it up almost any place. A piece of copper shielding braid is slipped over the 72 ohm twin lead as shown (34") and soldered to the coax plug to act as an unbalanced to balanced rf line transformer.

I have used the rig for some time and it has worked very well for portable operation and also for fixed station at the home QTH.

. . . W3IKH

5/7/9 Magazine?

Yep, we're starting still another little publication. This one is for the contest type operator and will list all of the contests scheduled for the next two months. It will also give the rules and present the results of contests which do not get full coverage in QST or CQ. This should also be helpful to ops working on certificates. $2 a year, published monthly. Use subscription form on page 93 or just send money and info. Clubs running contests are requested to furnish 73 with rules and results of their contests for publication in 5/7/9.

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NC-121 Receiver	129.95	4.69
NC-140 Receiver	189.95	6.67
NC-190 Receiver	219.95	7.76
NC-270 Receiver	279.95	9.92
NCX-3 Transceiver	369.00	13.14
NCXA AC Power Supply	110.00	3.79
NCXD DC Power Supply	119.95	4.15
NC-303 Receiver	449.00	16.03
NC-400 Receiver	895.00	32.13
HRO-60 Receiver	975.00	35.02
XCU-27 Calibrator for NC-140, NC-190, NCX-3, NC-303, & HRO-60	26.60	.80
NTS-3 Speaker for NC-140, NC-190, & NC-270	19.95	.62
NTS-2 Speaker for NC-303	21.95	.67

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BUYERS GUIDE

W2NSD/1

Perhaps I am unusual in that when I develop an interest in some piece of ham gear I rush to my magazines and try to find an ad or other information on that particular unit. This can be very frustrating. Chances are that the manufacturer has something else that he is excited about at the time and I have to look back for maybe a year or so trying to find information. Or else I may pull out two or three of the larger catalogs from ham equipment dealers, only to find that they apparently don't share my interest.

In order to provide one master listing of ham gear I decided to put together this section in 73. I've tried to include everything that I could get information on and put in all of the basic dope that you might want to know. If I've left out any products I'll expect to hear from you and perhaps we can run a supplement. If I've left out any crucial data please excuse me this time, I'll do better when we bring this up to date next year (*if* you like the idea).

The prices are current to the best of my knowledge, but don't be astounded if inflation gives them a bit of a boost.

Obviously I couldn't cover everything made for the ham market. In this list I've included transmitters, receivers, transceivers, power supplies, antenna tuners, some test equipment, and even a few accessories. I have in mind covering accessories more thoroughly in a couple of months and sometime next spring to compendiumize the antennas and associated equipment.

A good deal of this issue is taken up by our Buyers' Guide. I had hoped to be able to run more pages in this issue in order to have the usual number of articles, but my preoccupation with assembling the Guide kept me from hounding advertisers into submission, with the result that I couldn't run as many pages as I had hoped to. Oh well, enjoy the Guide. OK?

ALDEN

Alden Products Company
Brockton 73, Mass.

Alden Hambench. Steel construction, channeled to hold ac wires and control wiring. Top 26" x 60". Standard model has Masonite top, Deluxe model has Formica top 1¾" thick. Baked enamel finish. Standard Model: $99.95. Deluxe Model $139.95.

Knight

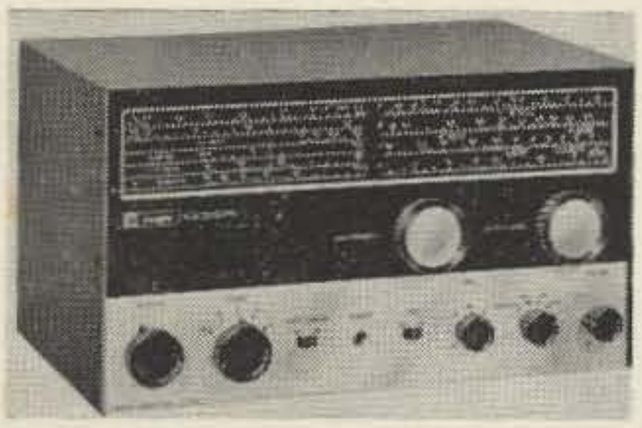
Allied Radio Corporation
100 N. Western Avenue,
Chicago 80, Ill.

150 watt transmitter kit. 80-10 meters, 150 watts input CW/AM-peak, 100 watts 6 meters. Controlled carrier screen modulation. Built-in VFO. Output pi net 40-600 ohms. 6146's output stage. 8½" x 17" x 10½" 28 lbs. TVI shielded. Power supply built in. T-150 Kit . . . $119.95.

Continuous coverage receiver, 540 kc to 30 mc with a separate bandspread control for tuning 80-10 meters. Built-in Q-multiplier. Four tuning bands, printed circuit bandswitch and circuit boards. 7 tubes plus rectifier & voltage regulator. Exalted BFO for SSB, provision for built-in crystal calibrator, noise limiter. R-100A Kit . . $99.95. S-Meter Kit . . $12.95. Speaker Kit . . $9.95.

60 watt transmitter, 80-6 meters (slightly less input on 6), CW/AM-peak. Controlled carrier screen modulation. Pi net output 40-600 ohms. Built in power supply. Xtal or separate VFO required. 6DQ6B fi-

nal. RF meter for simple tuning. T-60 Kit . . . $49.95.



Continuous tuning receiver, 530 kc to 36 mc and 47 mc to 54 mc. Five tuning bands. Separate bandspread tuning on 80-6 meter ham bands. BFO, noise limiter, antenna trimmer, provision for built in crystal calibrator, built in speaker. 5 tubes plus rectifier. R-55 Kit . . . $59.95.

100 kc crystal calibrator kit. Gives marker every 100 kc up to about 35 mc. Trimmer for zero beating WWV. Builds into R-100 or R-55 receivers. Powered by receiver. X-10 Kit . . . $10.95.
Self powered VFO, 80-10 meters. Can be keyed directly for break-in operation. Clapp oscillator for high stability. Calibrated on all ham bands. Output on 80 & 40 meters. Power supply built in. V-44 Kit . . . $29.95.

Alltronics-Howard

Alltronics-Howard Co.
Box 19
Boston 1, Massachusetts

The Model K Telewriter converter features linear discriminator, dual eye indicator, separate magnet supply, front panel jacks, loop current meter. Size: 3½ h, 19 w rack panel. Price: $189.00, cabinet $14.00.

AMECO

American Electronics Company
178 Herricks Road
Mineola, New York

Preamplifier Model PCL (left) for all bands 80-6 meters. Nuvistors give 20 db gain. Nuvistor preamplifier for 50, 144 or 220 mc (right) Model PV. Both require power from receiver or from PS-1 power supply. PV . . . $13.95. PCL . . . $24.95.

Converter (left) for one band 50-144-220 mc, two nuvistors, one 6J6. Any i-f output. No power built in. PS-1 power supply separate unit. Converters (right) for 6 or 2. Use tubes. 6ES8-6U8A-6J6. Output 7-11 mc or 14-18 mc. CN . . $44.95. CN Kit . . $31.95. PS-1 . . $11.50. PS-1 Kit . $10.50. CB6 . . $27.50. CB6 Kit . . $19.95. CB2 . . $33.95. CB2 Kit . . $23.95.

90 Watt transmitter (left, model TX-86), CW AM-peak. 6146 final. Pi net output 35-600 ohms. 5" x 7" x 7", 80-6 meters. Xtal controlled. Requires separate power supply (PS-3). 15 watt CW transmitter (right, model AC-1) 80-40 meters, crystal controlled. TX86 . . $109.95. TX86 Kit . . $84.95. PS-3 . . $44.95. AC-1 Kit . . $17.65.

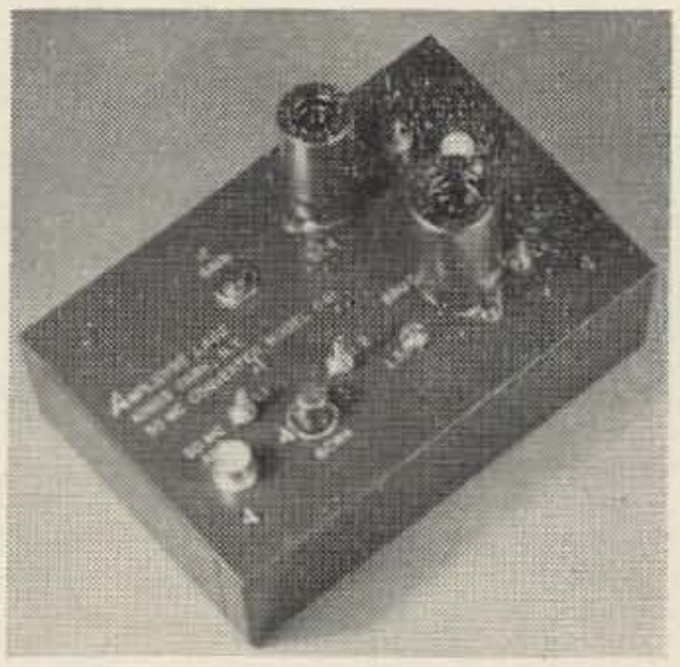
Model CLB (left) 6 meter mobile converter, 12 volts dc power. Model CMA (right), all band converter, 1700 kc-54 mc and 108-174 mc. 3¾" x 6" x 6¾". Requires crystal ($3.50). Uses internal battery. Transistorized. PS-2 power supply provides 12 vdc for CLB from 115 vac. CLB . . $24.95. CMA . . $64.50. PS-2 . . $8.50.

Model CHT, transistorized, built in battery or car battery through BS-9 adapter. CHT converts 2 meters to broadcast band. Can cover from 108-174 mc. Model CLT same as CHT except converts any ham band from 2-54 mc down to the broadcast band or any other i-f output. Model SNL squelch & noice limiter, 6 or 12 vdc. SNLT all transistor. CLT or CHT . . $35.95. BS-9 . . $2.95. SNL . . $17.75. SNLT . . $19.95.

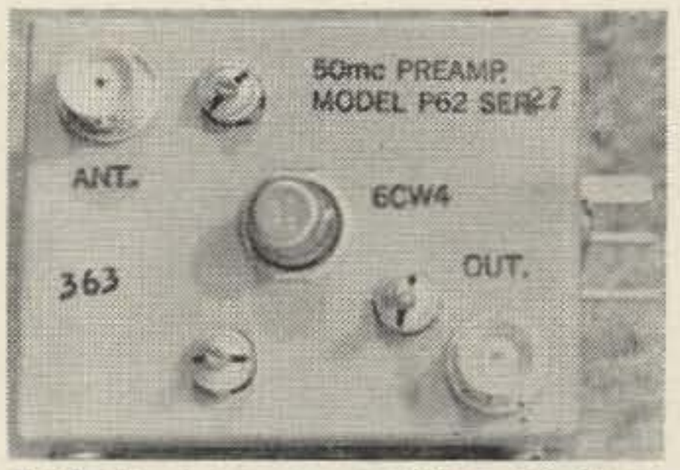
Amplidyne Labs

Amplidyne Laboratories
Box 673
Kings Park, L. I., N. Y.

C-23 two meter nuvistor converter. Two 6CW4's in grounded grid rf amplifier, 6J6 crystal oscillator, 6BQ7 mixer-*if* amplifier. Requires separate power supply or voltage from receiver. Output 14-18 mc. Special outputs $1 extra. BNC connectors. 4" x 6" x 2". $34.25. PS-4 Matching power supply $9.75 (right). C-14 1¼ meter nuvistor converter. Identical to the C-23 except input 220-225 mc and price $42.50.



C-61 six meter nuvistor converter. One 6CW4 grounded grid rf amplifier, 6BQ7 mixer and oscillator, 6C4 *if* amplifier. PS-4 matching supply. 14-18 mc output. BNC connectors. 4 x 6 x 2. $28.50.

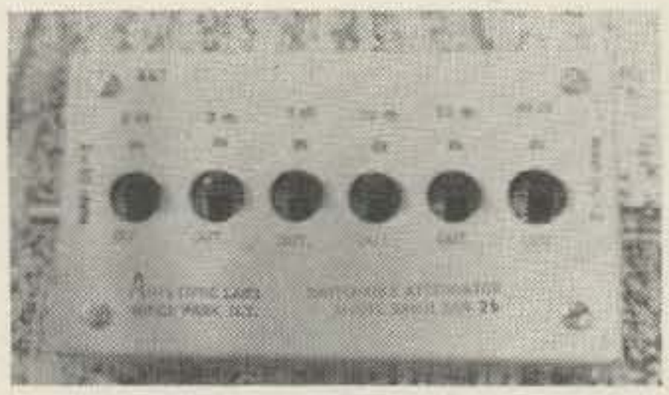


P-62 Nuvistor preamplifier, 50-54 mc BNC connectors, separate power supply required. $9.75.
P-25 nuvistor preamplifier, 144-148 mc, BNC's, separate power required. $9.75.

Model 621 six and two meter transmitter. 60 watts to GE 8150, 6L6's plate mod. Xtals or external VFO. Built in dummy load, separate loading controls, spotting button, metering of all stages including rf output using external meter (not supplied). $229.50.

126 nuvistor three band converter, 6-2-1¼ meters, built in power sup-

ply, 2-6CW4's, 6DJ8, 6J6. BNC connectors, four *if* outputs (7, 14, 26, 30.5 mc) available. $94.50.
Model 221 (right) is an adapter for the 621 transmitter and puts 18 watts on 220 mc. 6360 output. Uses 55 mc output, power supply, modulator and metering of 621. $72.50.

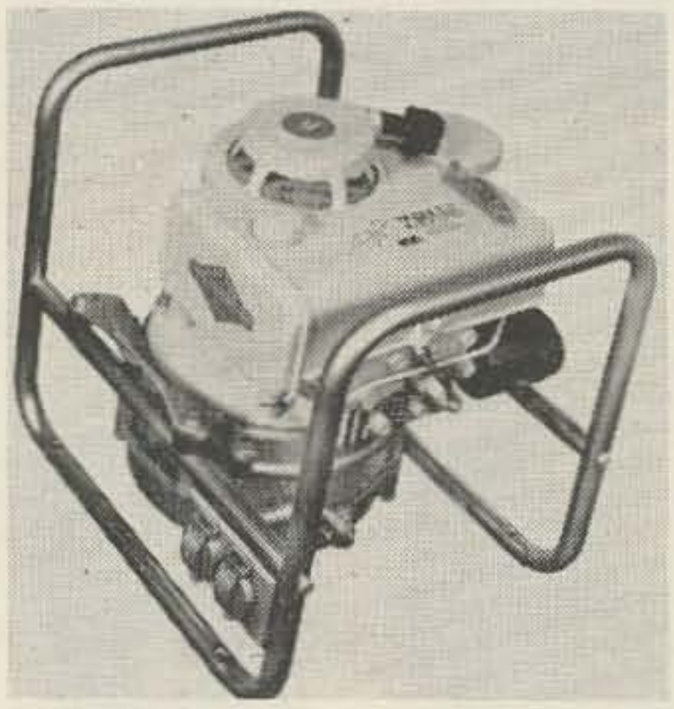


Model SA-601 switchable attenuator. Used for signal-to-noise, noise figure, gain measurements, etc. dc-500 mc. Up to 60 db attenuation. ½ watt. 2¼ x 5 x 3. $14.95.

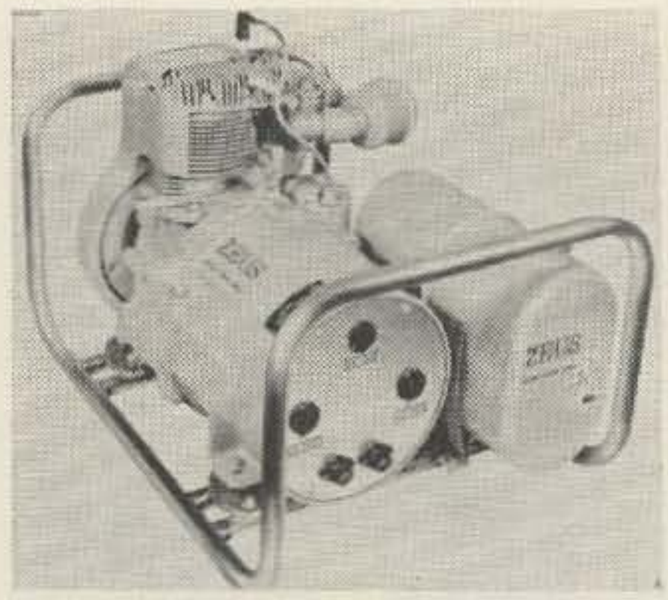
Antenna Specialists

Antenna Specialists
12435 Euclid Avenue
Cleveland 6, Ohio

The Antenna Specialists Zeus ASP-1000 power supply produces 1000 watts of 115 volt 60 cycle ac. The generator is driven by a self-contained gasoline engine and can be handled by one man. $197.50.



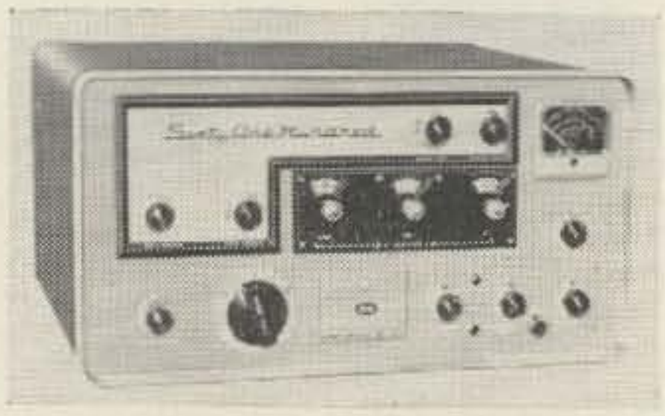
The Zeus ASP-1250-4 power supply delivers 1250 watts at 115 volts ac. This small generator is provided with handles for easy handling. $254.50.



The Zeus ASP-3000 electric power supply delivers 3000 watts of 60 cycle ac at either 115 or 230 volts. The self-contained gasoline engine consumes minute quantities of gasoline and runs quietly. The supply is completely fused and shock mounted. It is light enough to be moved by one man or carried easily by two. Rope starter model $575; electric starting model is $650.

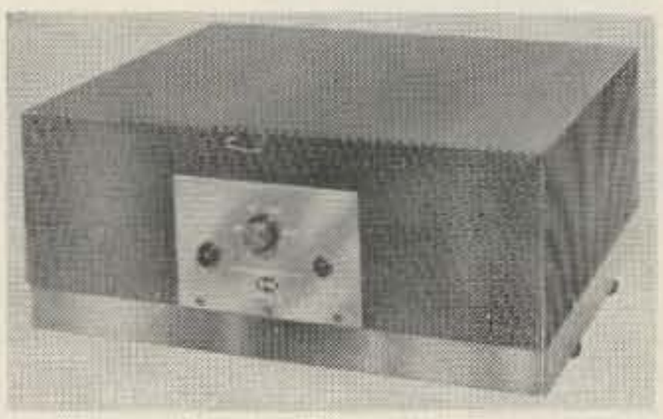
B & W

Barker & Williamson, Inc.
Bristol, Pennsylvania



Model 6100 transmitter. Uses crystal frequency synthesizer permitting exact frequency to be set on dials. Covers 10-80 meters, AM-CW-SSB. 2-6146's final, 180 watts CW or SSB, 90 watts AM. VOX, PTT, break-in CW. Built in solid state power supply. Crystal lattice filter. ALC for 10 db voice compression. $875.

Model LPA-1 1 KW grounded grid linear amplifier. 10-80 meters. For use with 100 watt output exciters (such as 6100). 2-813's. 1000 watts input on CW and SSB, 375 watts on AM. Requires separate power supply (LPS-1). Contains filament and bias supplies. $375.



Model LPC-1 power supply. Matching unit for LPA-1 linear. 2500 vdc at 400 ma. Used four 816's. 50 lbs, 8"H, 17"W, 14"D. Has removable control panel which can be mounted at operating position. Remote control cable provided. $205.

B F

B F Electronics
Box 602
Cardiff, California
The PC-1 and PC-2 mobile power supplies operate from 12 vdc with toroidal circuits. PC-1 has 500 and 250 vdc output at 150 watts. Price: kit $29.95, wired $41.50. PC-2 has outputs of 600 and 300 vdc at 150 watts. Price: kit $34.95, wired $47.50.

Clegg

Clegg Laboratories
Rt. 53, Mt. Tabor, New Jersey

Clegg Interceptor six and two meter receiver. Tunes 50-54 mc with built in converter for 144-148 mc. Flywheel dial, entire dial tunes one mc at a time. Nuvistor rf stages. Crystal lattice filter for selectivity. Designed for low cross-talk. Will tune any other bands, higher or lower, with converter. 15" w, 9" h, 9" d. 32 lbs. $473.

Clegg 99'er six meter transceiver. Double conversion receiver, S-meter, spotting switch. Transmitter crystal controlled (or external VFO), 8 watts to 7558 final, plate modulated. Receiver covers 50-52 mc for good bandspread. AC power supply built in. S-meter switches for transmitter tuning. 10" w, 6" h, 8" d. 14 lbs. $199.99.

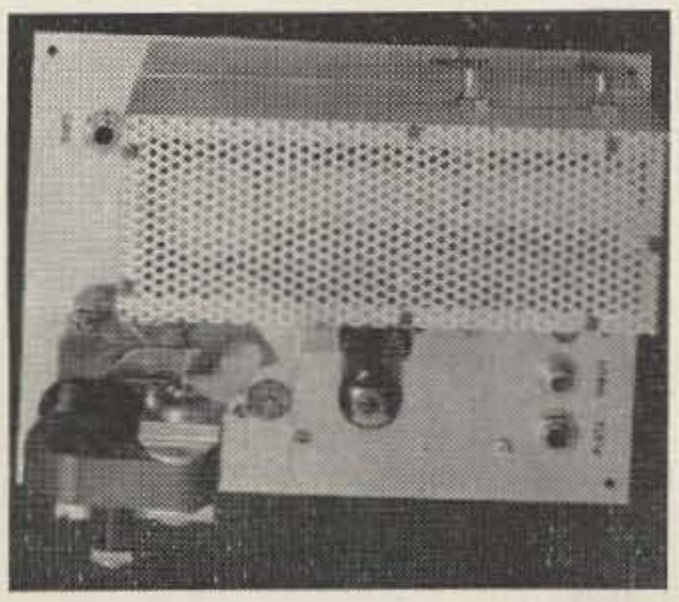
Clegg Thor, six meter transceiver. Receiver has crystal lattice filter for selectivity, BFO, tunes 50-52 mc, external speaker (not supplied). Designed for low cross modulation, images, *if* leakthrough. Transmitter is VFO in receiver frequency or crystal controlled. 60 watts on AM or CW to a 6883 final. Separate (but included) power supply and modulator uses two 6CU6's in Class B. S-meter switches for transmitter tuning automatically. Variable BFO injection for SSB detection and spotting. ANL. 12" w, 6" h, 8½" d. 15 lbs. Power unit 12" w, 6½" h, 8½" d. 27 lbs. $349.95. 12 vdc transistorized supply $119.95.

Clegg Venus VI, SSB transceiver for six meters. Receiver tunes 50-50.5 mc (or any other 500 kc band if specified), crystal lattice filter for selectivity, nuvistor front end. Transmitter 85 watts AM, SSB, CW to 6883 final. Tuning dial: 1 kc per division. Receiver may be offset from transmitter frequency by plus or minus 1 kc. Requires separate power supply. $475. AC power supply $115, 12 vdc supply $120.

Clegg Zeus six and two meter transmitter. 185 watts AM or CW on both bands to a 7034. 811A's class B plate modulation, 18 db speech clipping with automatic modulation control. Crystal oscillator or built in ultra-stable VFO. Flywheel tuning dial. Power supply and modulator in separate unit with interconnecting cable. $695.

Centimeg

Centimeg Electronics
312 East Imperial Highway
El Segundo, California



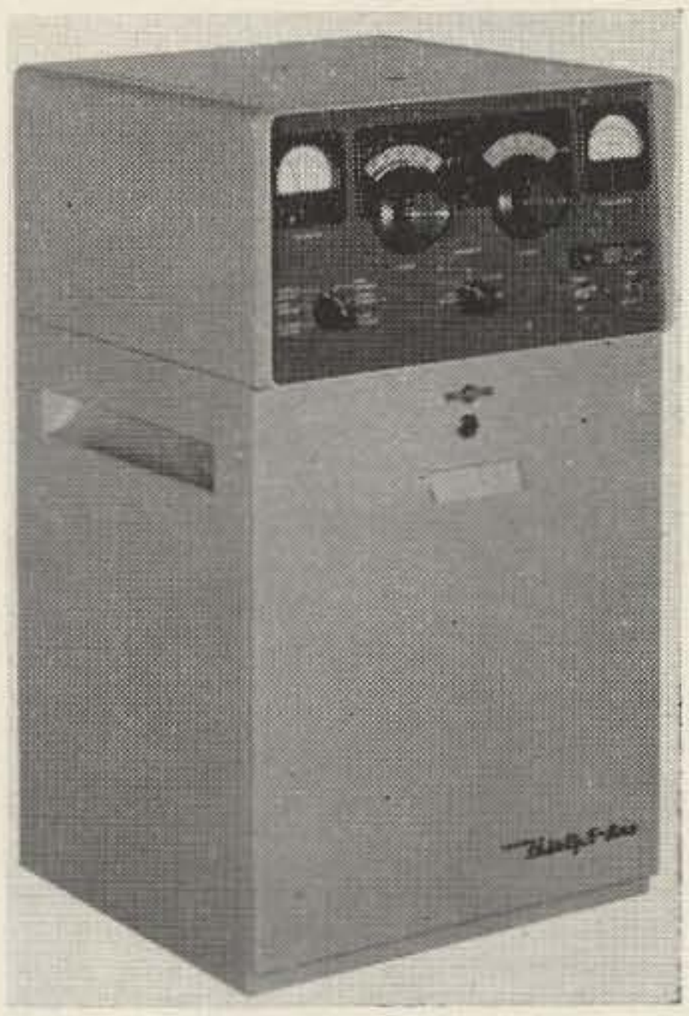
Model TA-4.3 is a 432 mc tripler. Driven by 5 watts at 144 mc final 2C39 50 watts input on 432 mc. Tank circuit is silver plated cavity. Blower. Separate power supply and modulator required. 8" x 5" x 5" h. $69.50 without 2C39, $84.50 with.

Collins

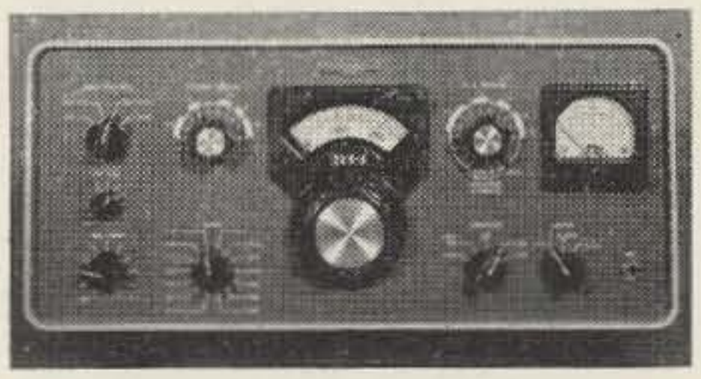
Collins Radio Company
Cedar Rapids, Iowa

The KWM-2 transceiver, 175 watts of PEP SSB or 160 watts CW on 14 200 kc bands between 3.4 and 29.7 mc. Features include filter type SSB, VOX, anti-trip, ALC, break-in CW and sidetone CW monitor. Power requirements may be obtained from the matching 516E-1 dc power supply or 516F-2 ac supply. Size: 7¾" h, 14¾" l, and 13¼" d. Weight: 18 lbs. Price: $1150.

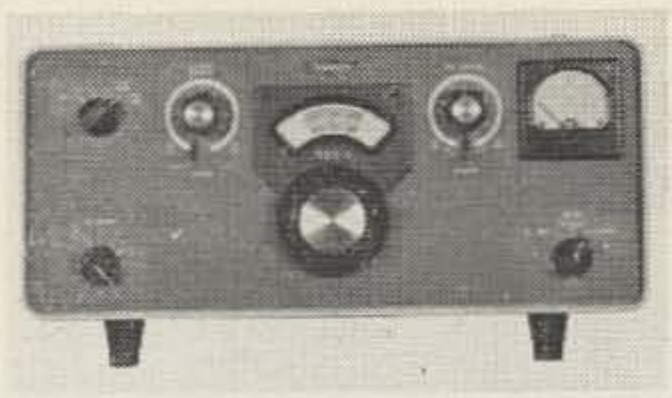
The 30L-1 is a table top linear amplifier for use with 100 watt transmitters. 4-811A's operate at 1 kw PEP from 80-10 meters. The self contained power supply uses silicon diodes. Size: 6½ h, 14¾ w, 13¾ d. Weight: 38 lbs. Price: $520.



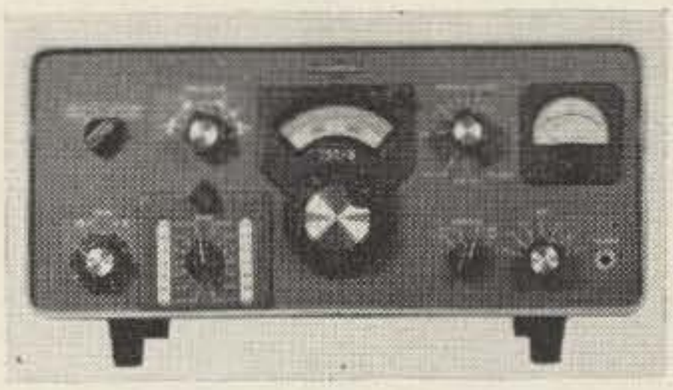
The 30S-1 is a grounded grid linear amplifier with 1 kw input to a 4CX1000A on all bands 80-10. Requires 100 watts drive. Self contained power supply, blower and ALC. Size: 30⅝ h, 17 w, 16⅝ d. Weight: 160 lbs. Price: $1556.



The 32S-3 transmitter, 175 watts PEP SSB or 160 watts CW on any 13 200 kc segments from 3.4 to 30 mc. 10 db of rf feedback, ALC, mechanical filter SSB, and carrier insertion keying. Size: 6⅞ h, 14½ w, 11⅝ d. Weight: 17 lbs. Price: $750 less power supply.



The 62S-1 converts a 14 mc AM, CW, SSB, or RTTY signal to 6 or 2 meters. Receiver sensitivity is 1.3 uv and power input 165 watts PEP. High voltage is taken from the present exciter. Size: 7¾ h, 14¾ w, 13¼ d. Weight: 26 lbs. Price: $1556.

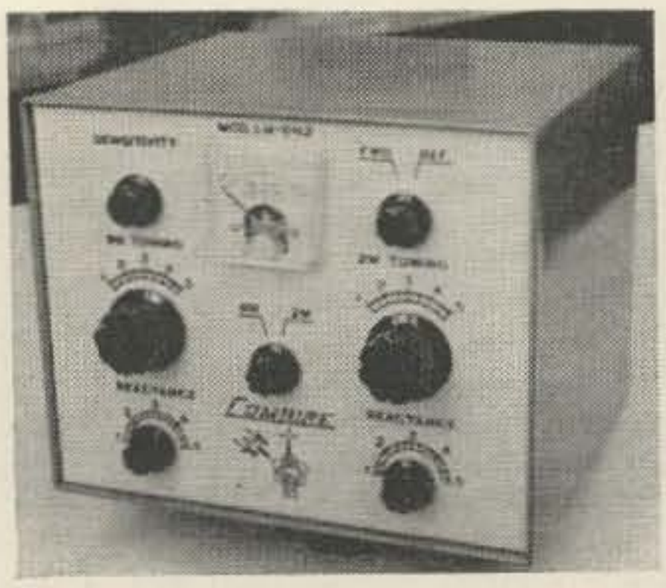


The 75S-3 receiver covers the 80-15 meter bands and 3-200 kc segments of the 10 meter band. The circuit uses 11 tubes, a 2.1 kc mechanical filter for SSB, and a 200 cycle crystal filter for CW. Size: 7¾" h, 14¾" w, 11½" d. Weight: 20 lbs. Price: $680.

Comaire

Comaire Electronics
Box 126
Ellsworth, Michigan

FLM-2 two meter line matching unit to match transmitter to feedline. FLM-6, same thing only for six meters. $19.95.



LM-6N2 Line matcher. Combination six and two meter antenna tuner with built in SWR power meter. 500 watts. 7½" x 6" x 7". 8 lbs. Tuners are completely separate. $59.75.

Davco

Davco Electronics Company
113 Norwood Avenue
Asheville, North Carolina

The DT-20a transmitter (left) operates on 80-10 meters with 20 watts SSB output, 8 watts AM. Transistorized, tube final, mechanical filter SSB generator, VFO, VOX, separate power supply, transceiver operation with DT-30. Size: 4 h, 7½ w, 5 d. Price: $345.00.

The DR-30 receiver (right) tunes all bands 80-10 plus WWV, broadcast and 3 other 500 kc bands. Completely transistorized, 2.1 kc mechanical filter, crystal calibrator, S-meter, ANL, crystal and variable BFO, double conversion, injection voltages for transceiver operation with DT20 exciter. Size: 4 h, 7½ w, 5 d. Price: $289.50. DQ-1 Q-multiplier, ac supply, speaker and battery holder $36.00.

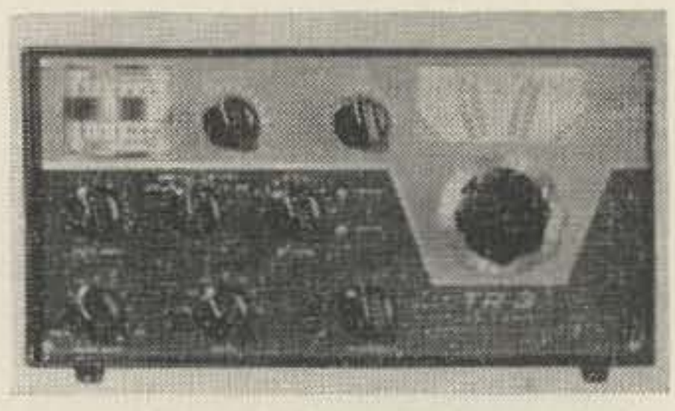
Dow Key

Dow Key Company
Thief River Falls, Minnesota

Model DKC-RFB 50-70 ohm impedance matching broadband preamplifier. 1.5-30 mc. Power can be taken from receiver. SO-239 connectors. 6CB6 tube. 1¼" x 2", 6 oz. $10.75.

Drake

R. L. Drake Company
Box 185
Miamisburg, Ohio 45342



The TR-3 transceiver covers 80-10 meters with 300 watts PEP SSB input or 260 watts shifted carrier CW input. 2.1 kc selectivity, .5 uv sensitivity, rf and af gain controls, product detector, crystal filter sideband, crystal calibrator, 3-12BJ6's in final, VOX, PTT, S-meter. Size: 5½ h, 10¾ w, 14⅜ d. Weight: 13½ lbs. Price: $550, AC-3 ac supply $79.95, DC-3 dc supply $129.95, RV-3 remote VFO $79.95, MS-3 speaker $19.95, MMB-3 mobile mount $3.95.

The 2-B receiver covers 80-10 meters and other bands with extra crystals. .5 uv sensitivity, .5-3.6 kc selectivity, slow or fast AVC, product or diode detector, triple conversion, noise limiter, preselector, less speaker, calibrator, Q-multiplier. Size:
Weight: Price: $279.95.
2-BQ Q-multiplier and speaker $39.95, 2-BS speaker $16.95, 2-AC calibrator $16.95.

EICO

Eico Electronic Instrument Co., Inc.
3300 Northern Blvd.
Long Island City 1, N. Y.

The #720 CW transmitter is a 90 watt rig for 80-10 meters. The 6146 final amplifier can be externally plate modulated for 65 watts of AM. Crystal control or external VFO such as the Eico 722. TVI suppressed, final protection by 6AQ5 clamper. Size: 15 w, 5 h, 9 d. Weight: 30 lbs. Price: Kit, $89.95; Wired, $129.95.

The #722 VFO provides a signal to drive any low power transmitter on 80 thru 10 meters. It has a self contained power supply and regulator. Size: 6 h, 8½ w, 9 d. Price: Kit, $44.95; Wired, $59.95.

The #723 CW transmitter is a 60 watt Novice or standby rig using crystal control or external VFO. An external modulator such as the Eico #730 can be used to plate modulate the 6DQ6B final. Single knob band and operate switches are incorporated. Size: 6 h, 8½ w, 11¼ d. Weight: 15 lbs. Price: Kit, $59.95; Wired, $89.95.

The #730 modulator delivers 50 watts of audio to plate modulate any 100 watt transmitter or drive a high power modulator. A multi-match transformer enables it to be used with any transmitter. Input can be from high or low impedance mike or phone patch. Size: 6 h, 14 w, 8 d. Weight: 21 lbs. Price: Kit, $59.95; Wired, $89.95.

Electrocom

Electrocom Industries
1105 N. Ironwood Drive
South Bend, Indiana

The FSC-250 frequency shift converter includes autostart, 3 power supplies, 2" monitor scope, and single channel or polar operation. Size: 3½ h, 19 w, 11 d. Price: $325.00.

Electronics Specialists

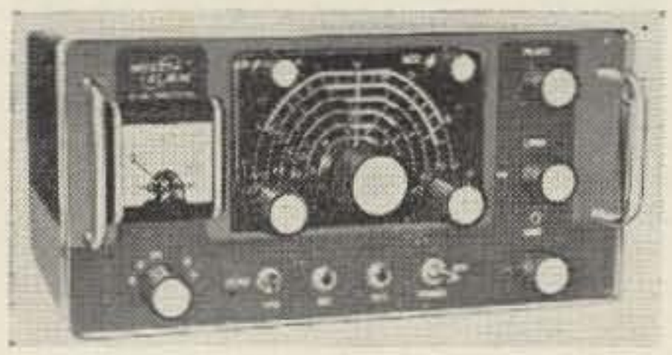
Electronic Specialists Laboratories
301 South Ayer Street
Harvard, Illinois

The ESL nuvistor pre-amp is available in models for 27-30, 50-54, 144-160, and 220-225 mc. Size: 2 w, 1⅝ h, 1⅝ d. Price: wired $8.95,

kit $5.95. All nuvistor converters $56.95 with power supply, $44.95 without.

Elmac

Multi-Elmac Company
21470 Coolidge Highway
Oak Park 37, Michigan



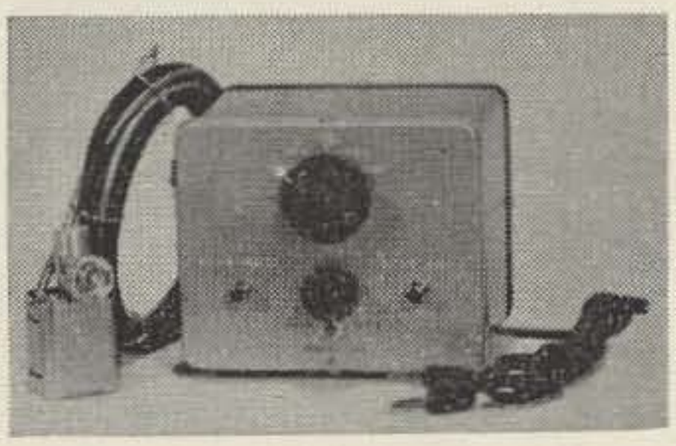
The AF-68 transmitter delivers 60 watts on 80-6 meters with a 6146 final. VFO, plate modulation, pi-net output, less power supply. Size: 6½ h, 13½ w, 7½ d. Weight: 18 lbs. Price: $205.00. M-1070 power supply $79.50 wired, $59.50 kit.

The ATR-4 transceiver covers 80-10 meters with 180 watts PEP SSB, 75 watts AM and 180 watts CW input. S-meter, 2.7 kc selectivity, product detector, 100 kc calibrator, parallel 6146's, VOX, anti-VOX, break-in CW, adjustable sidetone, push to talk. Size: 5½ h, 15¾ w, 9⅝ d. Weight: 19 lbs. Price: $750.00.

The PMR-8 receiver tunes 80-6 meter bands (50-52 mc on 6) and the broadcast band. 262 kc *if*, tunable BFO, noise limiter, AVC, antenna trimmer, less power supply. Size: 4 h, 7 w, 9 d. Weight: 11 lbs. Price: $189.50.

Fichter

Fichter Electronics
33 Myrtle Avenue
Cedar Grove, New Jersey



Model 102A Transtenna. Combination send-receive "switch," preselector, CW monitor. Power supply built in. Eliminates need for antenna relay, mutes receiver on transmit, provides sidetone by means of a transistor oscillator for CW monitoring: $76.45. Without sidetone $69.45.

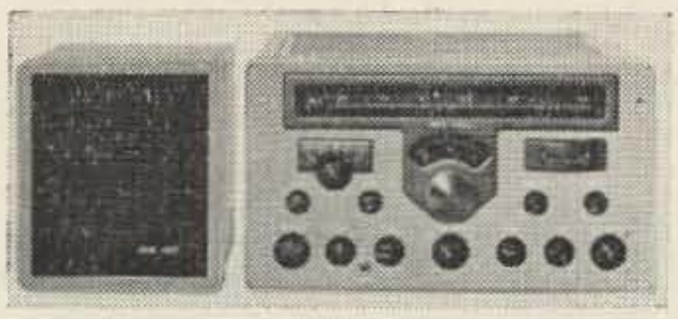
G.C.

G. C. Electronics Co.
400 S. Wyman St.
Rockford, Illinois

The 65-421 screen modulator kit can be used with most any CW transmitter. Self contained. Price: $11.95.

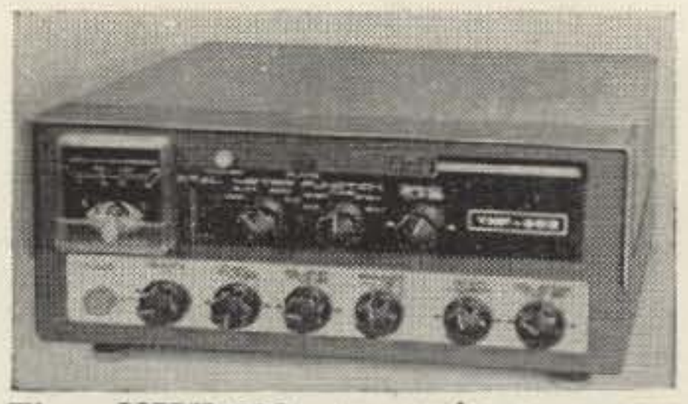
The DB23 preselector provides 26 to 36 db gain on 80-10 meters, depending on band and antenna matching. 3-6J6's, selenium power supply. Size: 5 h, 7⅝ w, 6 d. Weight: 6 lbs. Price: $49.50.

The HG-303 transmitter has 75 watts input to a 6146 on 80-10 meters. Silicon powered, crystal controlled, external VFO, grid block keying, pi net. Size: 4½ h, 9 w, 8 d. Weight: 22 lbs. Price: $109.95.



The RME-6900 is a ham-band receiver covering 80-10 meters and WWV on all modes. Noise limiter, BFO injection control, selectable sideband, crystal calibrator, silicon power supply. Size: 10 h, 16½ w, 10 d. Weight: 36 lbs. Price: $369.00, 6901 matching speaker $19.50.

The V-10 VFO covers 160-6 meters with output for any transmitter. Voltage regulator, calibrate switch, cathode follower. Size: 4⅝ h, 9⅛ w, 9⅝ d. Weight: 9 lbs. Price: $69.95. The VHF-126 converts 6, 2 and 1¼ meter signals to 7 mc. The tunable converter has dual speed tuning and double conversion on 144 and 220 mc. Size: 10 h, 16½ w, 10 d. Weight: 35 lbs. Price: $239.00.



The VHF-602 transmitter covers 50-54 and 144-148 mc with 60 watts CW and 50 watts AM input. Speech clipper, 10 tubes, 6146 final, TVI shielded, plate modulation. Size: 4¾ h, 12 w, 12⅜ d. Price: $179.95.

Geloso

American Geloso Electronics, Inc.
251 Park Avenue South
New York 10, New York

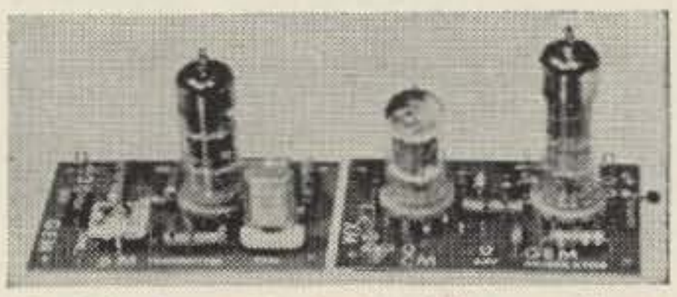
The G-209 amateur receiver covers 80-10 with 12 American tubes plus power supply. Double conversion, 5 position selectivity, crystal calibrator, noise clipper, S-meter. Size: 20½ w, 10½ h, 10¼ d. Weight: 52 lbs. Price: $249.50.

The G-222/TR transmitter covers 80-10 meters with VFO and plate modulation. Matches G-209, 75 watts to 6146, pi-net, power supply, cathode keying. Size: 20½ w, 10½ h, 10¼ d. Weight: 63 lbs. Price: $259.50.

The Geloso VFO's are available in 3 tuning ranges, all less power supply and tubes. 4/102 tunes 80-10 meters in 5 ranges, will drive 2-6146's. Price: $29.95. 4/103 has 144-148 mc output, drives 832 or 2E26. Price: $29.95.

Gem

Gem Electronics
P.O. Box 203
Tremont City, Ohio



(Left) 5 watt transmitter and exciter unit. Uses 7-8 mc xtals, 6AU8 or 6CX8 tube, freq range available 7-60 mc, 2½" x 4" p.c. Less tube $6.50, with tube $7.50.

(Right) 5 watt audio and modulator unit. 12AX7 & 6AQ5, input for xtal or carbon mike, 2½" x 4" p.c. $4.50. Tubes $2.00. Case $2.50. Also available are a nuvistor six meter converter, 2-6DS4's, 2-6CW4's, *if* BC to 18 mc $6.50 less tubes and xtal. Two meter model with either 10 mc or 50 mc *if* is $7.50. Case for converters with power connectors, etc., $6.50.

6 and 2 meter nuvistor cascode preamplifiers 2½" x 2" p.c. $4.00. Deluxe mount $6.50.

Gonset

Gonset Inc.
801 South Main Street
Burbank, California

Gonset Sidewinder. Two meter transceiver, SSB, AM, CW, mobile or fixed, PTT, two speed tuning dial, tunes 1 mc, bandswitches for each of the four mc, receiver transistorized for compactness and low drain, transmitter transistorized except mixer, driver and final. Crystal lattice filter. S-meter. 20 watts PEP to 6360 final, 6 watts AM. Transistorized power supply fastens to rear of transceiver. Draws .05 amps at 12.6 vdc in receive position, 1 amp for transmitter standby, 8 amps during transmit. Power supply operates from 12 vdc or 117 vac. 8¾" w, 4¼" h, transceiver 7" d, power supply 5½" d. Weight 19 lbs. Sidewinder: $349.95. Power supply kit $39.95, wired $49.95.

Hallicrafters

Hallicrafters
Chicago 24, Illinois

FPM-200 transistorized transceiver, 80-10 meters, sideband-CW-AM, 150 watts input on SSB PEP, VOX, dc power supply built in, two separate PTO's for bilateral operation. Tubes used only in driver and final (6146's). 16"W, 5"H, 11"D, 24½ lbs. $26.50.

HA-2 and HA-6 transverters. Converts ten meter transmitters and receivers to six or two meters. 5894 final for 120 watts input, can be driven by any 10M exciter from 10-100 watts. Requires separate (P-26) power supply. 8"H, 17"W, 9"D.

HA-5 VFO. Self powered heterodyne type VFO, 80-40-20 meter output plus 8 mc output for six and two meter transmitters. 7"W, 5"H, 8½"D. $79.95.
HA-8 modulation indicator. Built in power supply, indicates 100% modulation, complete with rf probe and connecting cable. 7½"W, 2½"H, 5¾"D. $24.95.

HT-32B transmitter. 80-10 meters, 144 watts PEP SSB to 6146's, dial reads in kc, power supply built in, double sideband AM, VOX, PTT, 20"W, 10½"H, 17"D, $725.

HT-33B Linear amplifier. 80-10 meters, PL-172 final will run full legal maximum input, designed to be driven by HT-32B, 20"W, 10½"H, 17"D. Power supply built in. Two panel meters. $995.

HT-37 transmitter, 144 watts PEP, 80-10 meters, CW, SSB, AM (both sidebands), VOX, 6146's final, power supply built in. 19¼"W, 9"H, 15½"D. $495.

HT-40 transmitter. 75 watts AM/CW to 6DQ5, 80-6 meters, tuning meter, crystal controlled, built in modulator and power supply, 13½" x 8" x 6½". $89.95 in kit form (HT-40KO, $109.95 wired).

HT-41 linear amplifier. Companion unit to HT-37, 80-10 meters, two 7094's, built in power supply, 19¼" x 9" x 15½", 1000 watts PEP, 800 watts CW, 400 watts AM phone. RF output meter. $395.
HA-10 tuner. Low frequency tuner for use with SX-117, tunes 85 kc to 3 mc. $24.95, less crystals.
HA-4 "T.O." keyer. Transistorized digital type keyer.

HT-44 transmitter. Designed to operate with SX-117 as transceiver or separately with own VFO, 200 watts SB/CW, 80-10 meters, AM/CW/SB, break-in CW, VOX, PTT, requires separate power supply (PS-150), 15" x 7" x 13".

HT-45 amplifier. 3-400Z grounded grid for 1000 watts CW, 2000 watts PEP SSB, 80-10 meters, requires separate power supply (P-45), 15" x 7" x 13".

SX-62A receiver. 550 kc-109 mc, AM/FM/CW, crystal calibrator, two rf stages, six position selectivity, 20"W, 16"H, 10½"D. Uses separate speaker. $430.

SX-100 receiver. General coverage 540 kc-34 mc, bandspread dial for 80-10 meter bands, T-notch filter, crystal calibrator, selectable sideband, S-meter, 18½" x 8½" x 10½". $325.

SX-101A receiver. Covers 80-10 meters plus dial scale for 6 & 2 meters for use with converters. S-meter, sideband selection, T-notch, five steps of selectivity. $445.

S-108 receiver. All band, 540 kc to 34 mc, calibrated bandspread on 80-10 meter amateur bands, BFO, ANL, built in speaker, 18½" x 8½" x 11". $139.95.

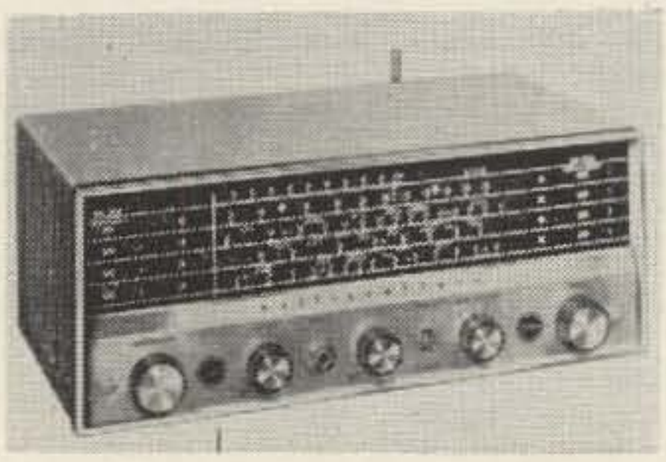
SX-110 receiver. Same as S-108 but includes S-meter, antenna trimmer, and crystal filter and uses separate speaker. $169.95.

SX-115 receiver, tunes 9 500 kc segments, 80-10 meters plus WWV, 1 kc calibration, 5-step selectivity, separate noise limiters for SSB/AM/CW, 100 kc calibrator, product detector for SSB and CW, S-meter, BFO, Q-multiplier, 16"W, 10½"H, 16"D. $599.50. R47 Speaker $12.95. R48 Speaker $19.95.

SX-117 triple conversion receiver. Product detector for SSB/CW, *if* noise limiter, T-notch filter, S-meter, selectivity .5, 2.5, 5 kc, 80-10 meters, BFO, ANL, crystal calibrator, 15" x 7" x 13". $379.95.

S-118 receiver. 185-420 kc, 495 kc-31 mc in five bands, BFO, loopstick antenna for low bands, built in speaker, $99.95.

S-119 receiver. Sky Buddy II. 2-5.5 mc, 6-16.5 mc, 535-1620 kc. Built in speaker, superhet, 3 tubes plus diode. $29.95 in kit form, $49.95 wired.



S-120 receiver. 550 kc-30 mc in four bands, electrical bandspread, BFO, loopstick antenna for lower bands, adjustable whip for SW, built in speaker, $69.95.

SX-140 receiver. 80-6 meters, S-meter, crystal calibrator, BFO, ANL, 13½"W, 6½"H, 8"D. $139.95 wired, $114.95 in kit form.

SR-150 transceiver, 80-10 meters, SSB-CW, 150 watts PEP SSB, 125 watts CW, 100 kc calibrator, receiver may be offset from transmit frequency by 2 kc, VOX, 6½" x 15" x 13", 17½ lbs. Requires separate power supply. $650. P150 ac $99.50. P150 dc $109.50. MR150 mounting rack $39.95.

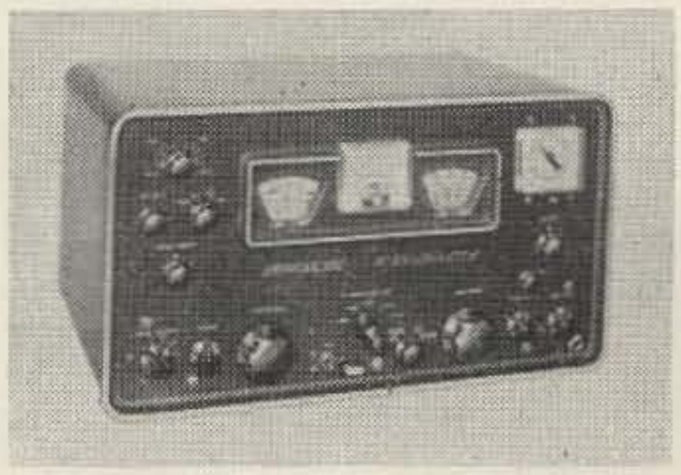
Hammarlund

Hammarlund Manufacturing Company, Inc.
460 West 34th Street
New York 1, N. Y.

The HK-1B is a transistorized, battery-operated electronic keyer. Keying relay, self contained battery, monitor and speaker. Ratio, volume and speed controls. Size: 2⅜ h, 7 w, 4½ d. Weight: 2½ lbs. without battery. Price: $39.95 less battery.

The HQ-100A is a general coverage .54-30 mc receiver with calibrated amateur bandspread. Logging scale, ANL, Q-multiplier, variable selectivity, less speaker and clock. Size: 9½ h, 16¼ w, 9⅛ d. Weight: 32 lbs. Price: $189.00

The HQ-110A is an amateur band receiver for 160-6 meters with dual conversion above 7 mc. Q-multiplier, crystal calibrator, product detector, ANL, S-meter, 1.5 uv sensitivity, less clock and speaker. Size: 9½ h, 16¼ w, 9⅛ d. Weight: 32 lbs. Price: $249.00; matching speaker $14.95.



The HQ-145X is a general coverage receiver .54-30 mc with calibrated amateur bandspread. Dual conversion above 10 mc, crystal filter, slot filter, ANL. Less speaker, clock, and crystal calibrator. Size: 10½ h, 19 w, 13 d. Weight: 44 lbs. Price: $279.00, crystal calibrator $15.95.

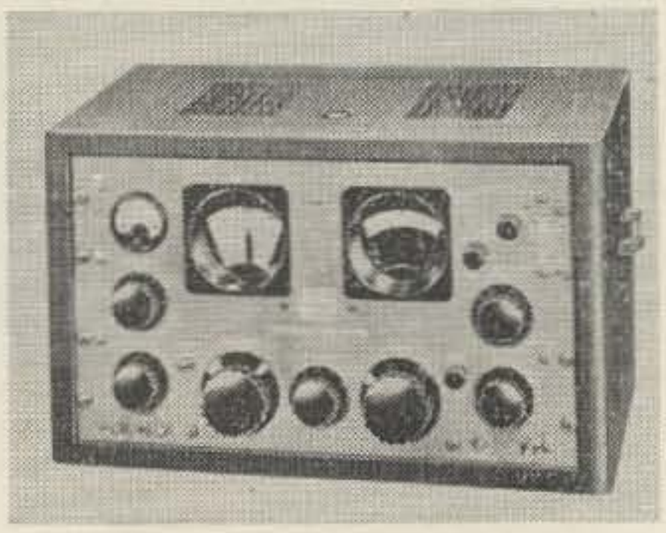
The HQ-170A receiver covers the 160-6 meter bands with triple conversion above 7 mc and dual below. Selectable sidebands, product detector, selectable AVC, slot filter, ANL-squelch, vernier tuning, .5-6 kc selectivity, S-meter, less speaker and clock-timer. Size: 10½ h, 19 w, 13 d. Weight: 38 lbs. Price: $369.00; clock $10.00; matching speaker $19.95; noise silencer accessory $33.50.

The HQ-180A is a general coverage .54-30 mc receiver with calibrated amateur bandspread. Triple conversion above 7.85 mc, dual below. S-meter, crystal filter, slot filter, product detector, selectable AVC, crystal calibrator, ANL, .5-6 kc selectivity, less speaker and clock. Size: 10½ h, 19 w, 13 d. Weight: 38 lbs. Price: $439.00

The HX-50 is an AM-CW-SSB transmitter for 10-80 meters. 130 watts PEP SSB, 130 watts CW, 90 watts AM. VFO, filter type sideband, pi network, VOX, anti-trip, antenna relay. Size: 9½ h, 17 w, 9 d. Weight: 45 lbs. Price: $449.50.

The HX-500 is an 80-10 meter transmitter for 100 watts of CW, PEP SSB, FM, or FSK and 25 watts of AM. Calibration to 200 cycles, VOX, anti-trip, ALC, built in power supply. Size: 11½ h, 19¼ w, 16⅛ d. Weight: 85 lbs. Price: $695.00.

The HXL-1 is a grounded grid linear for 1500 watts PEP SSB, and 1000 watts CW. 50-60 watts drive, 80-10 meters, built in silicon power supply, pi-network, provision for 160 meters. Size: 9⅛ h, 17½ w, 9½ d. Weight: lbs. Price: $375.00.



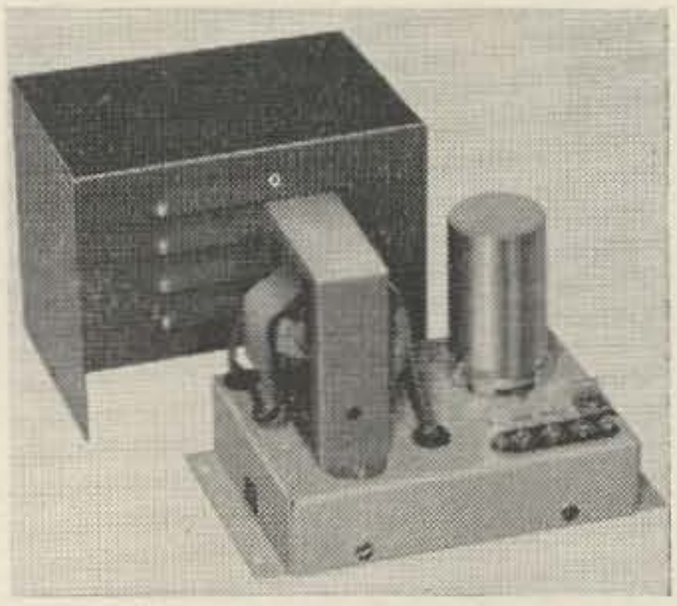
The SP-600-JX is a general coverage receiver for .54-54 mc. Dual conversion over 7.4 mc, crystal filter, .2-13 kc selectivity, 2.3 uv sensitivity, S-meter, phono input, less speaker. Size: 12¾ h, 21⅜ w, 17⅛ d. Weight: 88 lbs. Price: $1140.00.

Heath

Heath Company
Benton Harbor, Michigan

The DX-60 is a 90 watt AM or CW transmitter kit for 80-10 meters. 6146 final, low pass filter, carrier control modulator. Size: 6½ h, 13¾ w, 11½ d. Weight: 25 lbs. Price: $79.95.

The GC-1A Mohican is a transistorized, portable general coverage receiver. 10 transistors, 6 diodes, S-meter, ANL, BFO, speaker, calibrated amateur bandspread, less batteries or ac supply. Size: 6⅞ h, 12 w, 10 d. Weight: 18 lbs. Price: $109.95 kit, $193.50 wired. Accessory ac power supply $9.95.



The GP-11 vibrator power supply kit delivers 250 vdc at 100 ma from a 6 or 12 vdc source. Designed to power mobile transceivers. Silicon diodes. Size: 4⅝ h, 6½ w, 4⅛ d. Weight: 6 lbs. Price: $16.88.

The GR-91 is an SWL or Novice general coverage .55-30 mc receiver kit. BFO, noise limiter, electrical bandspread, speaker, antenna trimmer. Size: 5½ h, 12¼ w, 8¼ d. Weight: 15 lbs. Price: $39.95.

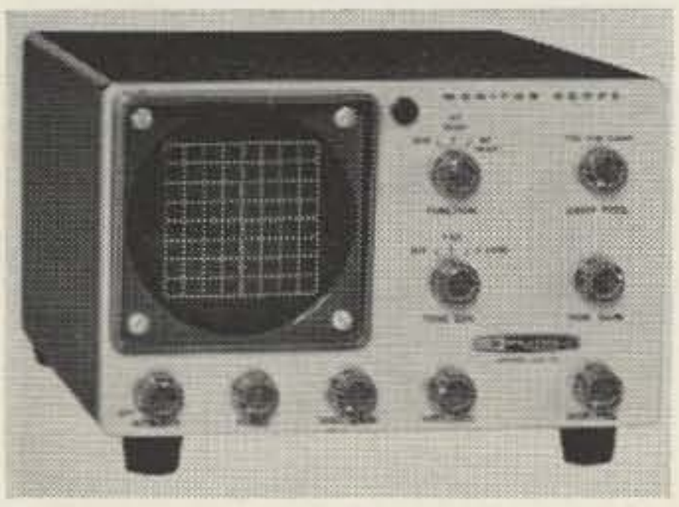
The HA-10 Warrior linear amplifier runs 1000 watts CW, 1000 watts PEP SSB, 400 watts AM, and 650 watts RTTY to 4-811A's with 50-75 watts drive. Self-contained power supply, forced air cooling, grounded grid circuit, TVI shielding. Size: 11⅝ h, 19½ w, 16 d. Weight: 99 lbs. Price: kit $229.95, wired $329.95.

The HA-20 is a 6 meter linear amplifier kit to match the HX-30. 2.5-10 watts drive, 125 watts PEP

SSB, 75 watts AM, push-pull 6146's, forced air cooling, self-contained power supply. Size: 10⅛ h, 16⅝ w, 10 d. Weight: 43 lbs. Price: $99.95.

The HD-11 is a Q-multiplier kit for use with any receiver having an *if* of 450-460 kc. 2 peaking positions, 1 rejection notch, built-in power supply. Price: $14.95.

The HG-10 is a VFO kit for all bands 80-2 meters. May be used with most transmitters, grid-block or cathode keying. Clapp oscillator, less power supply. Size: 6½ h, 9⅜ w, 9 d. Weight: 12 lbs. Price: $34.95.



The HO-10 is a monitor scope kit for observation of af and rf trapezoid patterns, AM and SSB envelopes on ham transmitters. Handles 5-1000 watts, 6-160 meters. Two-tone test signal, rf attenuator. Weight: 10 lbs. Price: $59.95.

The HR-10 is a 80-10 meter ham band receiver kit for all modes. S-meter, BFO, ANnl, AVC, less speaker and crystal calibrator. Size: 6½ h, 13¾ w, 11½ d. Weight: 21 lbs. Price: $79.95, crystal calibrator $8.95.

The HR-20 is an 80-10 meter mobile receiver kit. 8 tubes, product detector, noise limiter, slow or fast AVC, S-meter, less speaker and power supply. Size: 6¼ h, 12¼ w, 9¾ d. Weight: 17 lbs. Price: $134.50.
Mobile speaker $5.95, mobile base mount $4.95.

The HW-10 and HW-20 are 6 and 2 meter transceiver kits, respectively. 6 meter Shawnee covers 49.8-54 mc, 2 meter Pawnee 143.3-148.2 mc. Both feature built-in supply for 6, 12 or 120 volts. 10 watt 6360 final, push-to-talk microphone, VFO or crystals, internal speaker, 15 kc selectivity, double conversion, squelch, BFO, AVC. Size: 6 h, 12 w, 10 d. Weight: 34 lbs. Price: $199.95.

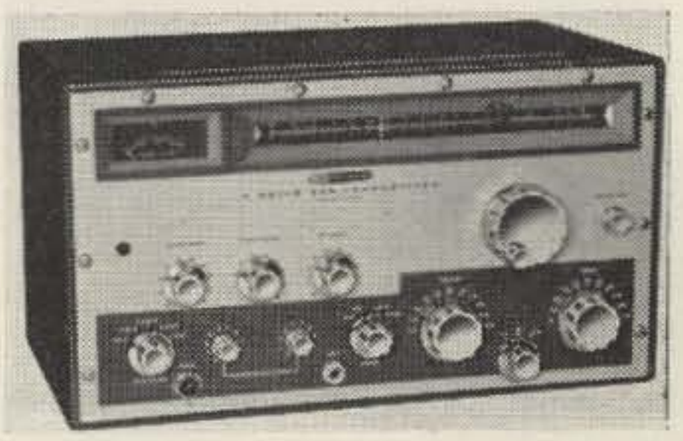
The HW-12, HW-22, and HW-32 are single band SSB transceivers for 80, 40 and 20 meters, respectively. LSB on 40 and 80, USB on 20. 200 watts input to 2-6GE5's, VOX, PTT, 14 tubes, crystal filter SSB, 2.7 kc selectivity, 1 uv sensitivity, S-meter, less microphone, crystal calibrator and power supply. Size: 6¼ h, 12 w, 9¾ d. Weight: 15 lbs. Price: $119.95, GH-12 push-to-talk microphone $6.95, crystal calibrator $8.95, HP-23 ac supply kit $39.95, HP-13 dc supply kit $59.95.

The HW-29A and HW-30, the Sixer and Twoer, are 6 and 2 meter transceiver kits. Crystal controlled transmitters, 5 watts input to a 6CL6, tunable superregenerative receiver, with microphone, less crystal and mobile power supply, built-in ac supply. Weight: 8 lbs. Price: $44.95, GP-11 mobile power supply kit $16.88.

The HX-10 Marauder is a 180 watt CW and PEP SSB, 75 watt AM, transmitter kit for 80-10 meters. Filter SSB, VOX ,anti-trip, break-in CW, ALC, 2-6146's in final, accessory socket, with power supply. Size: 11 5/5 h, 19 w, 16 d. Weight: 92 lbs. Price: $334.95.

The HX-11 CW transmitter kit runs 50 watts to a 6DQ6A on 80-10 meters. Crystal controlled, may be driven by external VFO. Band-switching, pi-network output. Size: 8½ h, 13 w, 7 d. Weight: 17 lbs. Price: $43.50.

The HX-20 is an SSB and CW mobile transmitter kit with 90 watt input. Matches HR-20 and uses same power supplies. Filter SSB, 6146 final, VOX, anti-trip, VFO, ALC, fixed loading, push to talk, less power supply. Size: 6¼ h, 12¼ w, 9¾ d. Weight: 19 lbs. Price: $199.95.



The HX-30 is a 6 meter SSB transmitter kit with 20 watts input on SSB, AM and CW. Phasing SSB, VOX, anti-trip, VFO, grid block keying. Size: 10⅛ h, 16⅝ w, 10 d. Weight: 50 lbs. Price: $189.95.

The RX-1 Mohawk is a 160-10 meter ham band receiver kit with calibrated scales for 6 and 2 meter converters. Product detector, T-notch filter, crystal calibrator, dual conversion, ANL, .5-5 kc selectivity, less speaker. Size: 11⅝ h, 19½ w, 16 d. Weight: 66 lbs. Price: $299.95, matching AK-5 speaker $10.95.

The SB-10 SSB adapter kit plugs into the TX-1 for conversion to phasing SSB with VOX and anti-trip. May be used with other transmitters. Size: 10 h, 6¾ w, 13 d. Weight: 12 lbs. Price: $93.50.

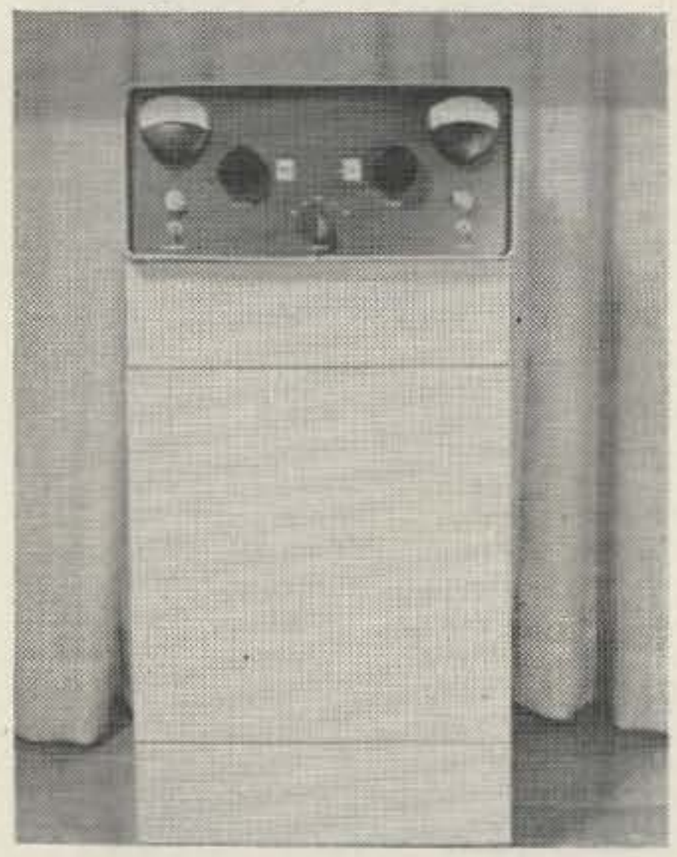
The SB-300 is an SSB ham band receiver kit for 80-10 meters. 1 kc calibration, crystal filter, variable AVC, crystal calibrator, .4-3.75 kc selectivity, linear tuning. Size: 6⅝ h, 13⅜ d, 14⅞ w. Weight: 17 lbs. Price: $264.95.

The TX-1 Apache is a 180 watt SSB and CW, 150 watt AM, transmitter kit to match the RX-1. 80-10 meters, provision for SSB adapter, speech clipping, timed sequence keying, 2-6146's in final, with power supply. Size: 11⅝ h, 19½ w, 16 d. Weight: 110 lbs. Price: $252.50.

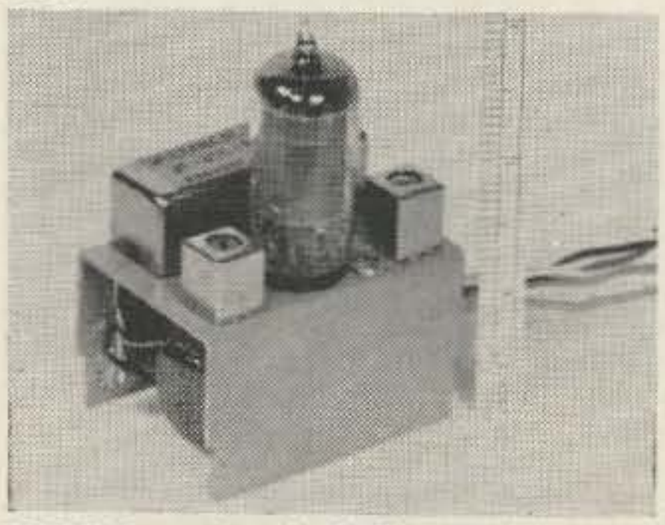
The VHF-1 Seneca is a 6 and 2 meter transmitter kit with 140 watt CW and 120 watt AM input to 2-6146's. VFO, 4 crystal sockets, carrier control modulation, band-switching, power supplies included. Size: 10⅛ h, 16⅝ w, 10 d. Weight: 59 lbs. Price: $179.95.

Henry

Henry Radio
11240 West Olympic Boulevard
Los Angeles 64, California



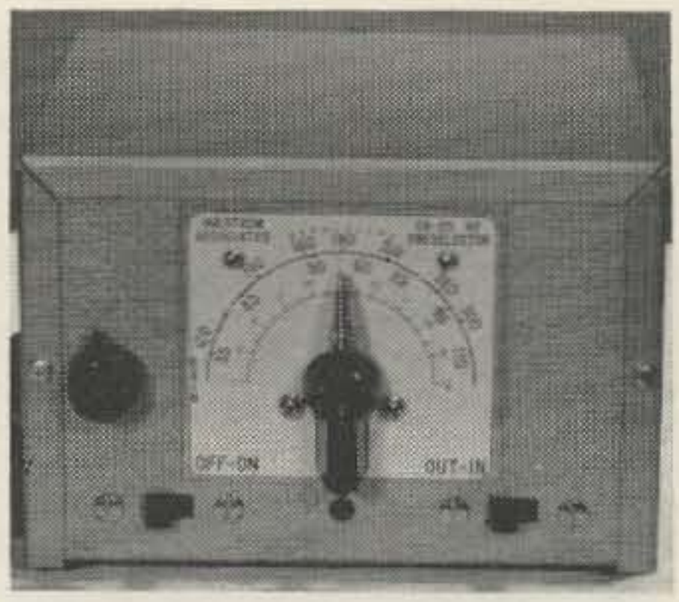
II-K linear amplifier. 2000 watts PEP input, 80-40-20-15-10 meters. 1 KW AM, CW, NFM, RTTY. Uses two 3-400Z Eimac zero bias triodes. 80-150 watts drive required. Size: rf section 10½" h, 14¾" w, 13½" d; power supply console 29½" h, 14¾" w, 13½" d. Weight: 158 lbs. Two panel meters for final plate voltage, plate current and grid current.



DMF-2 mechanical filter. An accessory for the Drake 2A and 2B receivers or any other 455 kc i-f receiver. Complete unit ready to mount in receiver to increase selectivity. Price $29.

Holstrom

Holstrom Associates
P.O. Box 8640
Sacramento 22, California

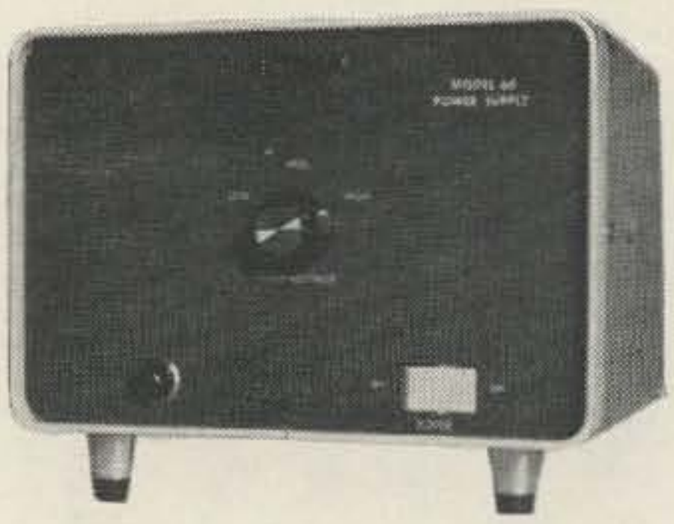


Model SK-20 preselector. Tunes 3.5-30 mc, built in power supply. $18.98

Hunter

Hunter Manufacturing Company
Iowa City, Iowa

Bandit 1000A linear amplifier. Two UE572 zero bias triodes in grounded grid, 1000 watts PEP, 80-10 meters, rf output meter, 70-100 watts drive required, instant heating filaments good for mobile operation, power supply required, antenna relay built in, 9½"W, 7¾"H, 9"D, 11 lbs. $299.

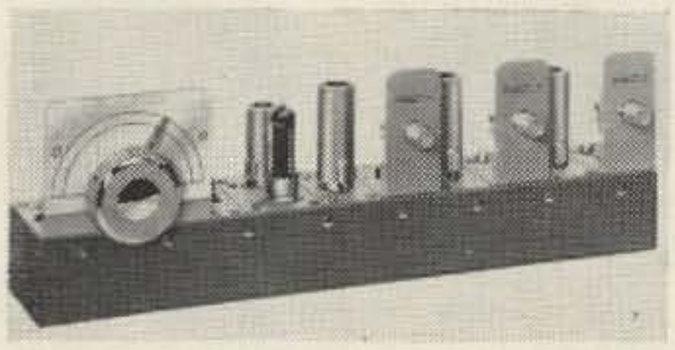


Model 60 power supply for 1000A $186.

Bandit 2000A linear amplifier. Four UE572A's for 2000 watts PEP, 1000 watts CW, 80-10 meters, 160 watts drive required, rf output meter, internal antenna relay, built in power supply, 14¾" W, 6¾"H, 14"D, 45 lbs. $575.

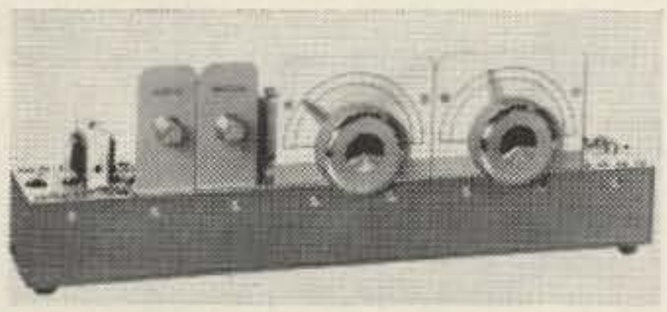
International Crystal

International Crystal Manufacturing Co., Inc.
18 North Lee
Oklahoma City, Oklahoma

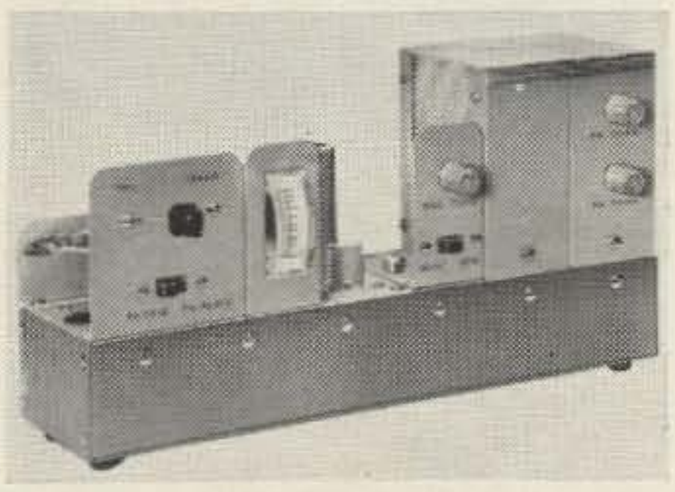


AOF VFO kit. 8-9 mc VFO for six and two meter transmitters. ½ watt output. AOF-89 includes VFO and buffer $22. AOF-90 includes multiplier for six meter output $29. AOF-91 includes multiplier for 6/2M output $36. 6BH6 osc., OB-2 VR, 12BY7 buffer-amplifier-multiplier.

AOP power supply kits. AOP-100 350 vdc 150 ma intermittent, 100 ma continuous, 6.3 vac @ 5 a, $18.50. AOP-200 650 vdc 250 ma intermittent, 200 ma continuous, 6.3 vac @ 10 a, $32.50.



AOR receiver kits. Superhet circuit (except for 150-450 kc model which is tuned rf) with regenerative second detector. Nuvistor rf amplifier. Additional Add-On-Circuits may be used to expand these basic receivers. AOR41-150-450 kc; AOR42 2-6 mc; AOR43 6-18 mc; AOR44 80/40 meter; AOR45 15/10 meter are all $62.50. AOR46 six meter; AOR47 two meter are $66.50. All AOR receivers include power supply and 4" speaker.



AOT-50 transmitter kit. 50W CW, 80/40M, 6DQ6. Includes meter, send-receive switch, xtal, less power supply. $35.00.

Irving

Irving Electronics Co.
P.O. Box 9222
San Antonio 4, Texas

The Hiverter 50 converts the output of any 14 mc transmitter to 50 mc AM, CW or SSB. 6146 final, pi-net output, less power supply. Size: 8 h, 10 w, 7 d. Price: $99.50.
The Preverter 50 and Preverter 144 are 6 and 2 meter transistorized preamplifiers. Band pass circuitry, silver plated chsasis. Price: $14.95.

J & D

J & D Labs
P.O. Box 266
Eatontown, New Jersey

Model 500 linear amplifier, 4X150 final, built in silicon power supply, 500 watts SSB and CW, 250 watts AM. Single band unit, available for and band from 80 to 2 meters. Requires ten watts drive. $149.95.
Model 1000 linear amplifier. Same as model 500, only uses two 4X150's in the final for 1000 watts SSB and CW, 500 watts AM. Available for any band 80-2 meters. 7"H, 15"W, 9"D. $199.95.
Model 1062 linear amplifier, two 7034's, up to 900 watts AM & CW, 1000 watts PEP SSB. Covers both two and six meters. Requires only 5 watts drive. $199.95. Power supply for 1062 is $119.95.

Musketeer Quad grounded grid four band (80-15 meters) amplifier. Power supply built in. Runs Eimac 3-400Z for full KW on SSB or CW and 600 watts on AM. Drives with any 70-250 watt exciter. 8"H, 12"W, 7"D. $329.90.
Musketeer Six, same as above but for six meters: $39.90.
Musketeer Two, same as Quad except for two meters: $319.90.

Johnson

E. F. Johnson Company
Waseca, Minnesota

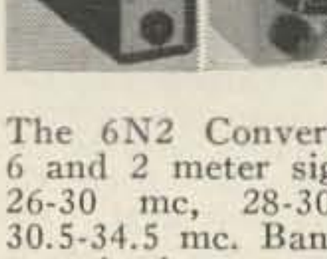
The Adventurer (left) is a complete Novice transmitter with 50 watts of CW input on all bands 80-10. It is crystal controlled and may be used with an external VFO and modulator. The 807 final is TVI shielded. Price: $69.95 in kit form only. Speech amplifier/modulator accessory kit, with tubes $12.25.
The Ranger II (right) is a 75 watt CW and 65 watt AM transmitter that covers all bands from 160 to 6 meters. The 15 tube circuit (6146 final) features VFO, plate modulation, timed sequence keying and TVI suppression. Power supply built in. The auxiliary socket may be used to power other equipment or drive a high power modulator. Size: 15½ w, 9⅝ h, 14 d. Weight: 43 lbs. Price: Kit, $249.50; Wired, $359.50.

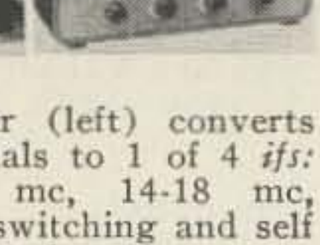
The Valiant II (left) is a 275 watt CW and SSB, 200 watts AM transmitter covering all bands 160-10. Provisions are included for an auxiliary SSB exciter. The 21 tube circuit features VFO, timed sequence keying, self contained power supply and TVI suppression. Size: 11½ h, 21 w, 14 d. Weight: 73 lbs. Price: Kit, $375; Wired, $495.
The Viking SSB Adapter (right) is a bandswitching filter type exciter for 80-10 meters designed for use with the Valiant or Valiant II. The 13 tube circuit includes an external power supply and needs only rf excitation and amplification from the transmitter. Size: rf unit 8 w, 11½ h, 14 d; power supply 3¾ w, 6¾ h, 7½ d. Total weight: 25 lbs. Price: $369.50 wired only.

The Challenger transmitter, 120 watts CW and 70 watts AM, covers 80-6 meters. 7 tube circuit, 6DQ6A's final, screen modulator, shaped keying and crystal oscillator with provisions for external VFO. Built in power supply. Weight: 24 lbs. Price: Kit, $124.75; Wired, $169.75.
The Five Hundred is a complete 500 watt AM, 600 watt CW transmitter for the 80-10 meter bands. The 23 tube circuit features timed sequence keying, VFO, pi network output, TVI suppression and a PL175A final amplifier. An auxiliary SSB exciter will drive the transmitter to 500 watts. The rf chassis is 21 w, 11⅝ h, 16½ d; the power supply-modulator chassis is 20⅜ w, 15¾ h, 10⅞ d. Total weight: 173 lbs. Price: $1050 wired only.

The Thunderbolt (left) is a 1000 watt linear amplifier covering 3.5-30 mc. It features a self contained power supply, 2-PL175A's, and less than 20 watts required drive. The one chassis is designed for table top operation. Size: 21 w, 11⅝ h, 16½ d. Weight: 120 lbs. Price: $659 wired only.

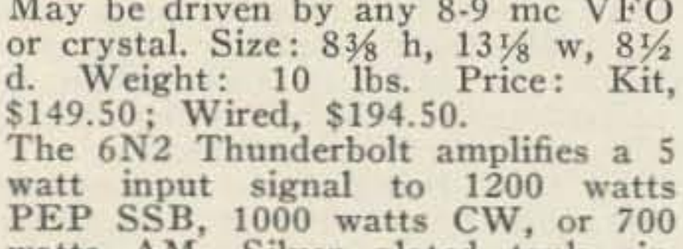
The Invader (right) is a 200 watt CW and SSB transmitter for the 80-10 meter bands. The 17 tube and 6 diode circuit includes VOX, anti-trip, filter sideband generation and self contained power supply. Size: 11⅝ h, 21 w, 17½ d. Weight: 53 lbs. Price: $619.50 wired only.





The Hi-power Converter converts the Viking Invader to the Invader 2000 to give 2 kw PEP SSB, 1 kw CW, or 800 watts AM. The kit includes new controls and panel for the Invader to make it identical to the Invader 2000. Size: 11¼ h, 19¾ w, 14½ d. Weight: 102 lbs. Price: $619.50.

The Invader-2000 combines all features of the preceding Invader and Hi-power converter in one complete transmitter. Sizes and weights are identical to each of the 2 preceding units. Price: $1229.

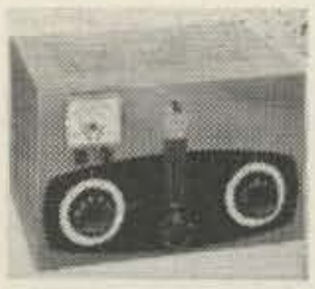


The 6N2 Converter (left) converts 6 and 2 meter signals to 1 of 4 *ifs:* 26-30 mc, 28-30 mc, 14-18 mc, 30.5-34.5 mc. Bandswitching and self contained power supply. Size: 5 h, 2¾ w, 12 d. Weight: 2 lbs. Price: Kit, $59.95; Wired, $89.95.

The 6N2 VFO replaces 8 to 9 mc crystals in any 6 or 2 meter transmitter. Includes a VR tube but requires external power. Size: 4 w, 5 h, 4½ d. Weight: 2 lbs. Price: Kit, $34.95; Wired, $54.95.

The 6N2 is a bandswitching transmitter for 6 and 2 meters. Requires an external power supply and modulator. 150 watts input CW, 100 watts AM to 5894. TVI suppression. May be driven by any 8-9 mc VFO or crystal. Size: 8⅜ h, 13⅛ w, 8½ d. Weight: 10 lbs. Price: Kit, $149.50; Wired, $194.50.

The 6N2 Thunderbolt amplifies a 5 watt input signal to 1200 watts PEP SSB, 1000 watts CW, or 700 watts AM. Silver plated tank circuits, 2-7034 final amplifiers, self contained power supply. Size: 21 w, 11⅝ h, 16½ d. Weight: 120 lbs. Price: $549.50 wired only.



The Kilowatt Matchbox (left) provides all features of the 275 watt Matchbox plus a built in antenna change-over system. Size: 17¼ w, 10⅞ h, 12⅛ d. Weight: 27 lbs. Price: $154.50 with directional coupler.

The 275 watt Matchbox (right) matches 52 ohm coaxial input to 25 to 1500 ohm balanced or 25 to 3000 ohm unbalanced lines over the 3.5-30 mc range. Optional directional coupler gives continuous reading of SWR and relative power. Size: 9⅞ w, 10½ d, 7 h. Weight: 11 lbs. Price: $94.95 with directional coupler, $64.95 without.

Kolin

Kolin Engineering Company
Box 357
Bronxville, New York

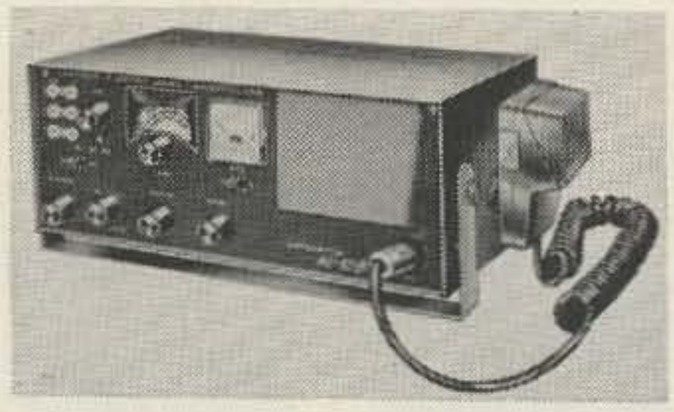
The NL-1 and NL-2 are solid state noise limiters for tube and transistor receivers respectively. Silicon diodes, use with any diode detector. Price: NL-1 $7.95, NL-2 $9.95.

Lafayette

Lafayette Radio Electronics Corporation
111 Jericho Turnpike
Syosset, L. I., New York

The HE-30 is a general coverage .55-30 mc receiver with calibrated amateur bandspread. Q-multiplier, S-meter, BFO, less speaker. Size: 7 h, 15 w, 10 d. Price: $99.95; HE-11 matching speaker $7.95.

The HE-40 is a general coverage .55-30 mc receiver for the Novice or SWL. Electrical bandspread, AVC, S-meter, ANL, BFO, internal speaker. Size: 5⅞ h, 13½ w, 8¾ d. Weight: 12 lbs. Price: $49.95.
Model 351 is a double pole double throw coaxial switch. Price $12.95.



The HE-45-B a 6 meter transceiver with 14 watts input to a 2E26 final. Built-in 12 and 115 volt supplies and speaker. Pi-network, external VFO input, S-meter, spotting switch, noise limiter, superhet receiver. Size: 5 h, 12 w, 8½ d. Weight: 15 lbs. Price: $119.95. HE-50A is the same as the HE-45 except it covers 10 meters. $89.95.

The HE-55 Squelcher (left) is a noise eliminator and squelch for use with all superhet receivers and transceivers. Reduces noise, quiets receiver under no-signal conditions, 2 tubes, takes power from receiver. Size: 2¼ h, 3 w, 4¼ d. Weight: 1 lb. Price: $10.95.
The HE-26 (right) is a hybrid phone patch for use with almost any transmitter and receiver. VU meter, gain control, complete switching. Size: 3½ h, 5½ w, 4 d. Weight: 3 lbs. Price: $22.50.

The HE-61A (left) is a 6 meter VFO with 8-9 mc output for use with most 6M transmitters and transceivers. 2 tubes, power cable, crystal plug, les power supply. Size: 3¾ w, 4¾ h, 4¼ d. Weight: 3 lbs. Price: $19.95.
Model HE-62 is the same except it covers 10 meters. Same price.
The HE-56 (right) and HE-71 are 6 and 2 meter converters, respectively, converting 50-54 mc and 144-148 mc to 7-11 mc. 2 tubes in HE-56, 3 in HE-71, self-contained power supply. Size: 7⅝ h, 3½ w, 5⅝ d. Weight: 6 lbs. Price: HE-56, $29.95; HE-71, $32.95.

The HE-73 is a preselector and converter for 80-10 meters. Preselector only on 80 and 40, preselector or converter on 20, 15 and 10. Converts to 80 meters, self powered, gives 22 to 36 db gain. Size: 6 h, 10 w, 8 d. Price: $49.50.

The HE-74 Starchief is a VFO for 80-6 meters with output to drive most amateur transmitters. 4 tubes plus self-contained power supply, crystal socket, output voltage to 20 volts. Size: 7¾ h, 8¾ w, 10 d. Weight: 10 lbs. Price: $44.50.

The HE-80WX is a communications receiver for .55-30 and 48-54 mc with calibrated amateur bandspread 80-10. 14 tubes, product detector, S-meter, crystal calibrator, Q-multiplier, ANL, less speaker. Size: 7½ h, 17 w, 10 d. Price: $149.50.

The KT-390 Starflite is a 80-10 meter transmitter kit with 90 watts input to a 6146 on CW or carrier-controlled AM. Grid-block keying, low-pass filter, pi-network output, internal silicon power supply. Weight: 25 lbs. Price: $79.50.

The TM-59A is an S-meter for use with any superhet receiver with AVC. Wheatstone bridge circuit, 4 connecting leads, calibrated to 30 db over S9. Price: $7.95.

Linear Systems

Linear Systems Inc.
605 University Avenue
Los Gatos, California

LSA-3 Broadband Linear Amplifier. Uses four GE 7984's in parallel for 500 watts input, 20-40-80 meters bandswitching, separate matching power supply, 25 watts drive, for shack or mobile use. 4½"H, 6½"W, 10"D, 5¼ lbs. Pi-net 50 ohm output. Price is $150. With ac or dc supply $249.50.

Adcom 350-12, dc to dc transistorized converter. 4½" x 6½" x 8", 8 lbs. 12 vdc to 800 v @ 400 ma or 600 v @ 500 ma and 275 v @ 200 ma. Also 0-110 v @ 30 ma neg adj bias. Provides power for most sideband transceivers on market: TR-3, SR-150, Galaxy 300, Swan, KWM-2, etc. Price $125.

Adcom 500, dc to dc transistorized converter. 13 vdc input to 1250 v @ 400 ma, 300 v @ 200 ma, 90 v dc neg zener regulated, adj 0-90. 4½" x 7" x 9". 9 lbs. $150.

Adcom 1000, dc to dc transistorized converter. 13 vdc input gives 2250 v @ 450 ma, 300 v @ 100 ma, 0-110 v neg adj bias, 0-90 v adj bias. 4½" x 7" x 9", 15 lbs. $250.

Adcom 350-ac. 117 vac 50/60 cycle input, 800 v @ 400 ma or 600 v @ 500 ma and 275 v @ 200 ma, 0-110 v neg adj bias, 6.3 vac 6A, 12.6 vac 6A, 12.0 vdc @ 200 ma. 4" x 6½" x 8". $99.50.

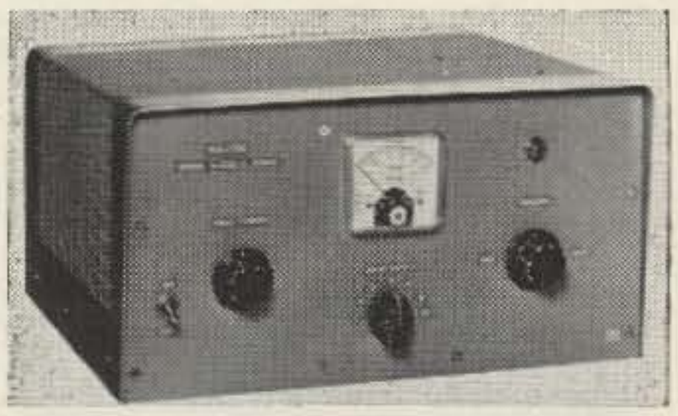
INV-12150. Input 12 vdc (to 15 vdc), output 120 vac 60 cycle square-wave. 150 watts continuous, 4" x 4" x 6", 6½ lbs. $60.

INV-12400. Input 12-15 vdc, output 120 vac 60 cycle squarewave. 400 watts peak, 300 watts continuous, 4½" x 7" x 9", 16 lbs. $119.50.

Master Mobile

Master Mobile Mounts, Inc.
4125 West Jefferson Blvd.
Los Angeles 16, Calif.

The MPS-800 and MPS-1250 power supplies deliver high voltage dc from 12 vdc input. Size: 2¾ h, 8 w, 9 d. MPS-800 has outputs of 800 v at 275 ma, 300 v at 150 ma and –90 v bias. Price: $119.50. MPS-1250 has outputs of 1250 v at 400 ma, 300 v at 150 ma and –90 v bias. Price: $139.50.



The K-73 linear amplifier for mobile SSB runs 750 watts PEP to 2-811A's on 80-10 meters. Self contained power supply, 50 watts drive, pi-net output. Size: 6½ h, 13½ w, 12½ d. Weight: 15½ lbs. Price: $289.50, RC-73 remote control $17.95.

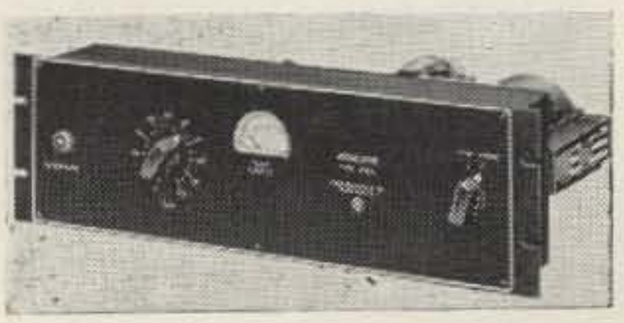
Millen

James Millen Mfg. Co., Inc.
Malden, Massachusetts

The #92200 Transmatch is an antenna coupler with reflectometer to couple 52 ohm input to 10-1000 ohm coax output. Handles 2 kw, bandswitching 80-10 meters. Size: 7 h, 14 w, 13⅝ d. Weight: 17 lbs. Price: $129.50.

The #90932 transmitter monitor is bandswitching 80-6 meters using a 2" scope tube. Beam blanked in standby, envelope or trapezoid pattern. Size: 7¼ h, 5½ w, 11 d. Weight: 8 lbs.

The #90801 transmitter provides 90 watts input CW, 67 watts phone to a 6146. Covers 80-10, TVI shielding, 5 meter scales. With one set of coils, less tubes, power supply, VFO and modulator. Size: 3½ h, 19 w, 9 d. Price: $75.00.

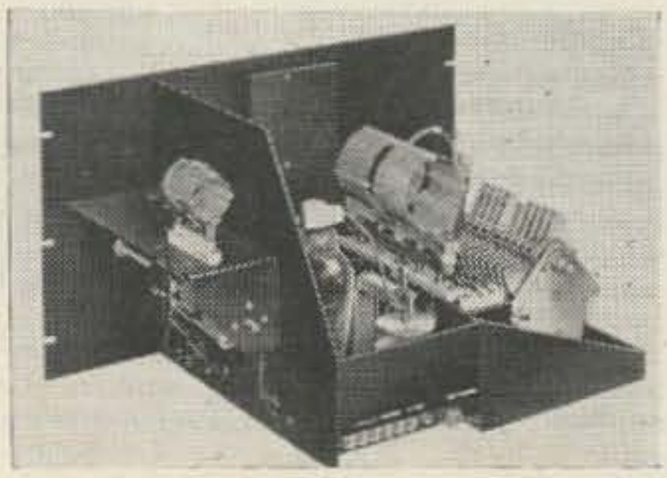


The #90831 modulator will plate modulate most transmitters up to 110 watts. 4000 ohm output, pr 6146's

less tubes and power supply. Size: 3½ h, 19 w, 6 d. Price: $60.00.
The #90811 amplifier gives 110 watt CW or 85 watt phone output on 20-2 meters. Plug in coils, 829B final. Less power supply, tube, modulator and meters. Price: $45.00.

The #90281 power supply provides 700 vdc at 235 ma and 6 vac at 4 amps. 2-816's, 2 section filter, less tubes. Size: 8¾ h, 19 w, 8 d. Weight: 56 lbs. Price: $94.50.
The #90201 power supply delivers 250 vdc at 115 ma, 105 vdc regulated at 35 ma, and 6.3 vac at 4.2 amps. Price: $52.50.

The #90711 VFO covers 80-10 meters with a built-in power supply. 3 tubes, rectifier and regulator. Size: 9¼ h, 12¾ w, 12 d. Weight: 26 lbs. Price: $124.50.



The #90881 is an rf power amplifier using plug in coils for 160-10 meters. 520 watts to 2-812A's, less power supply and tubes. Size: 10½ h, 19 w, 13 d. Weight: 13 lbs. Price: $100.50.

Mosley

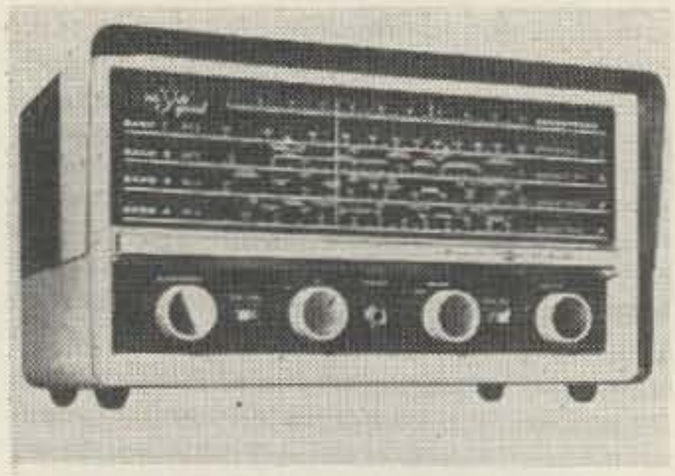
Mosley Electronics, Inc.
4610 North Lindbergh Boulevard
Bridgeton, Missouri

Model CM-1 receiver. 80-10 meters, double conversion, AM and SSB detectors, S-meter, separate speaker, ANL, 10½" x 7½" x 8" d. $182.70. Matching speaker $16.95.

National

National Radio Company, Inc.
Melrose 76, Mass.

The HRO-60 is an 18 tube receiver for 50-430 kc and .48-54 mc. Coils are furnished for 1.7-30 mc, others extra. Slide rule dial, double conversion, selectivity to 100 cycles, 8 watts audio, 110 or 220 vac supply. Less speaker. Size: 10⅛ h, 19¾ w, 16 d. Weight: 88 lbs. Price: $975, matching speaker $29.95.



The NC-60B is a Novice or SWL general coverage receiver covering .54-31 mc in 4 bands. Built in speaker, 5 tubes, electrical bandspread, BFO. Size: 7⅝ h, 13½ w, 8⅝ d. Weight: 15 lbs. Price: $59.95.

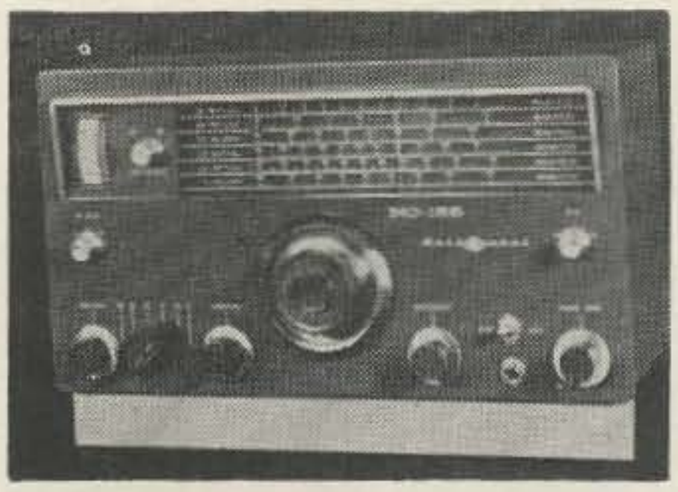
The VFO-62 is a 8-9 mc vfo for use with any 6 or 2 meter transmitter. Self powered, crystal socket, bandswitching, spotting switch. Size: 5¼ h, 6½ w, 5½ d. Weight: 6 lbs. Price: $49.95.

The NC-77X is a general coverage receiver for the SWL or Novice. 4 bands, .54-31 mc, built in speaker, transformer operated, electrical bandspread. NC-77XW has walnut cabinet. Size: 7⅝ h, 13½ w, 9 d. Weight: 18 lbs. Price: NC-77X, $69.95; NC-77XW, $89.95.

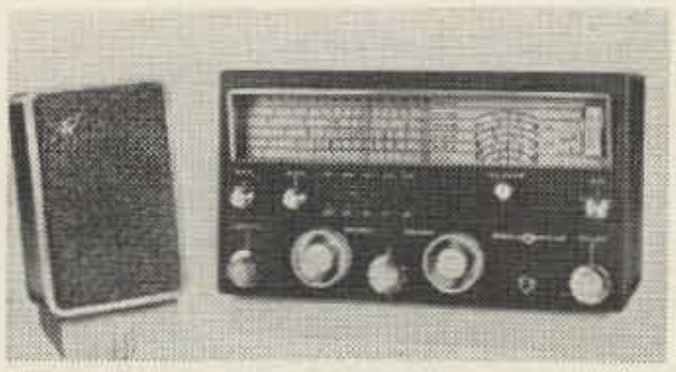
The NC-105 is a general coverage receiver, tuning .55-30 mc in 4 bands. Q-multiplier, S-meter, electrical bandspread, product detector, tuner output. NC-105W has walnut cabinet. Size: 7⅝ h, 13½ w, 8⅝ d. Weight: 27 lbs. Price: NC-105, $119.95; NC-105W, $139.95.

The NC-121 is a general coverage receiver, tuning .55-30 mc in 4 bands. Logging scale, Q-multiplier, tuner output, BFO, noise limiter, built in speaker. NC-121W has walnut cabinet. Size: 7⅝ h, 13½ w, 9 d. Weight: 28 lbs. Price: NC-121, $129.95; NC-121W, $149.95.

The NC-140 is a general coverage receiver for .54-31 mc in 5 bands with calibrated amateur bandspread. Dual conversion above 4 mc, Q-multiplier, noise limiter, product detector, less speaker. Size: 8⅝ h, 15⅝ w, 9 d. Price: $189.95.



The NC-155 is a ham band receiver for 80-6 meters. Dual conversion, S-meter, .6-5 kc selectivity, product detector, less speaker. Size: 8⅝ h, 15⅝ w, 9 d. Weight: 28 lb. Price: $199.95.



The NC-190 is a general coverage .54-30 mc receiver with amateur bandspread. Double conversion above 4 mc, noise limiter, .6-5 kc selectivity, product detector, 5 bands, less speaker. Size: 8¾ h, 15¾ w, 9 d. Weight: 28 lbs. Price: $219.95.

The NC-270 is a ham band receiver for 80-6 meters. .6-5 kc selectivity, S-meter, noise limiter, crystal calibrator, product detector, T-notch, selectable sideband, less speaker. Size: 8⅝ h, 15⅝ w, 9 d. Weight: 28 lbs. Price: $279.95; matching NTS-3 speaker $19.95.

The NC-303 covers 160-10 meter ham bands only; 6, 2 and 1¼ meter scales for use with accessory converters. .4-8 kc selectivity, noise limiter, Q-multiplier, double conversion, selectable sideband, voltage and current regulation, less speaker. Size: 19¼ w, 11¼ h, 15 d. Weight: 64 lbs. Price: $449; matching NTS-2 speaker $21.95.

The NC-400 covers .54-31 mc in 7 bands, with amateur bandspread for 80-10. Product detector, logging scale, S-meter, 150 cycle to 16 kc selectivity, optional crystal control and mechanical filters. Size: 19¼ w, 11¼ h, 16 d. Price: $895. Speaker $21.95.

The NCX-3 is a transceiver for 80, 40, and 20 meters. 200 watts PEP SSB, 180 watts CW, 100 watts AM, VOX, push-to-talk, grid block keying, S-meter, product detector, filter SSB, 2.5 kc selectivity. Less power supply and speaker. Size: 6 h, 13⅝ w, 11⅜ d. Weight: 25 lbs. Price: $369.95. AC supply/speaker, $110; 12 vdc supply, $119.95.

Parks

Parks Electronics Laboratory
Route 2, Box 35
Beaverton, Oregon

The Model 50-1 6 meter converter uses a 6CW4 and 6U8A to give output on 7-11, 10-14, 14-18, 26-30, 27-31, 28-32, or 30.5-34.5 mc. 1.5 mc bandwidth, self-contained power supply, choice of connectors. Price: $34.50.

The 144-1 is a cascode nuvistorized 2 meter converter with possible *if*s of 7-11, 10-14, 14-18, 22-26, 24-28, 26-30, 27-31, 28-32, 30.5-34.5 or 50-54 mc. 4 mc bandwidth, choice of connectors, 3 db noise figure, power supply included. Price: $54.50.

The Model 25 code wheel sends VVV or CQ and your call at 8 wpm. Switching between wheels and key jack. Includes 4 blank discs. Price: $25.00. Extra discs 3/$1.00.

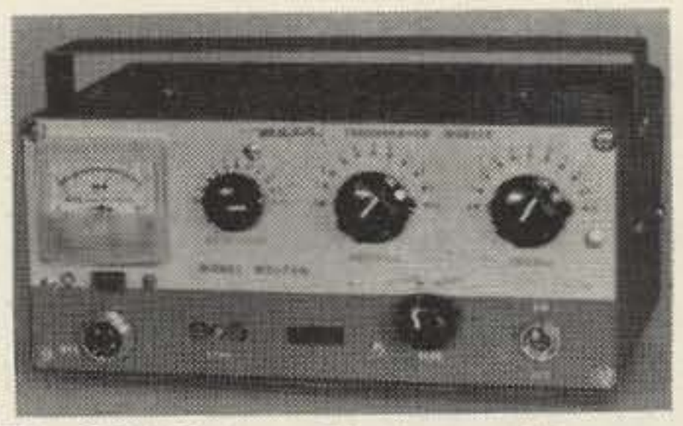
The 144-1P 2 meter preamplifier uses 2 nuvistors to give a 2.5 db noise figure. Built-in power supply, 4 mc bandwidth, UHF connectors. Price: $25.00.

Pausan

Pausan Company
Mars Amateur Radio Division
P. O. Box 946
San Rafael, Calif.

The CC-12 control console contains a speaker, phone patch, VU meter, kw SWR bridge, and blank switches. Size: 6½ h, 9½ w, 7 d. Price: $57.50.

The EK-20 is an transistorized electronic keyer with built-in ac power supply. Monitoring audio, speaker, 10-50 wpm. Price: $29.95.



The MT-75A mobile transmitter operates on 80 or 40 with 18 watts input. Less power supply. Size: 3½ h, 7½ w, 5 d. Price: $59.50.
The SP-1000 2 kw PEP SSB linear uses 4-811A's, 2-866's for legal limit. 50-75 watts drive, grounded grid, built-in supply, pi-output, less tubes. Price: $299.50.
The Mars phone patch can be used on AM or SSB. Hybrid circuit, rf filters, gain controls, VU meter. Price: $27.95.
The Mars SWR bridge measures SWR in 50 or 75 ohm lines. Price: $17.95.
The Mars transistorized oscillator-monitor uses rf pickup for monitoring. Self-contained battery supply. Price: $14.95.

P & H

P & H Electronics, Inc.
424 Columbia Street
Lafayette, Indiana

LA-400C Linear amplifier. 80-10 meters, four converted 1625's in grounded grid, 800 watts PEP on SSB, 400 watts CW, 230 watts AM controlled carrier linear AM, 185 watts AM constant carrier, built in power supply, 20-100 watts drive required, metered, 9" x 15" x 10½", 55 lbs., $179.95 in kit form, $219.95 wired.

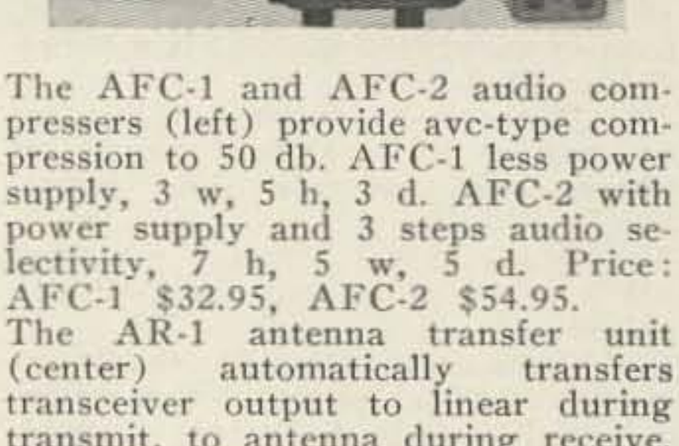
LA-500M "Spitfire" linear amplifier. 80-10 meters, six 12JB6's in grounded grid, 1000 watts PEP on SSB, mobile or fixed, uses separate power supply, 3" x 12" x 15", 14 lbs, built in antenna switching. $189.95.
Model PS-1000, 115 vac supply for LA-500M $119.95.
Model PS-1000B, 12 vdc supply for LA-500M $179.95.

2-150 transmitting converter. Converts 20 meter output of any exciter (AM-SSB, etc.) to two meters. 7854 final, 175 watts PEP on SSB, 165 watts CW, 90 watts linear AM. Built in power supply. 9" x 15" x 10½", 45 lbs. 10-100 watts drive required. Well metered. $329.95.
6-150 transmitting converter. Almost the same as the 2-150 except converts 20 meters to six meters, final 8117. Price $299.95.

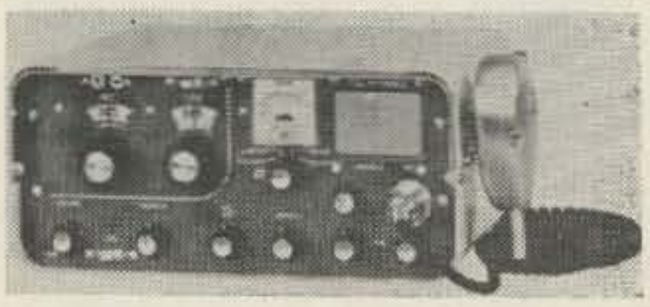
The AFC-1 and AFC-2 audio compressers (left) provide avc-type compression to 50 db. AFC-1 less power supply, 3 w, 5 h, 3 d. AFC-2 with power supply and 3 steps audio selectivity, 7 h, 5 w, 5 d. Price: AFC-1 $32.95, AFC-2 $54.95.
The AR-1 antenna transfer unit (center) automatically transfers transceiver output to linear during transmit, to antenna during receive. Size: 3 h, 4 w, 4 d. Price: $32.50.
The DI-1 rf distortion indicator (right) displays a trapezoid or envelope pattern on a 3" tube. 160-6 meters, 5 watts to 2 kw. Price: $99.95, TT-1 two-tone oscillator $19.95.

Polytronics

Polytronics Laboratories, Inc.
88 Clinton Road
West Caldwe'l, New Jersey 07007



The Poly-Comm 6 transceiver covers 50-54 mc with 10 watts output. Nuvistor front end, squelch, noise limiter, S-meter. Weight: 23 lbs. Price: ac only $309.50, ac/12vdc $329.50.



The Poly-Comm 2 transceiver covers 144-148 mc with over 7 watts output. Nuvistor front end, squelch, noise limiter, S-meter, triple conversion, 10 diodes, 19 tubes. Weight: 23 lbs. Price: ac only $329.50, ac/12vdc $349.50.

Redline

Redline Company
Jaffrey, New Hampshire

ply. $? Redline 2X3=1¼ tripler. Feed output of 144 mc transmitter into this unit and out comes 432 mc. Five watts input give three watts output. No power supply required. $? Redline 1296'er. Transmitting tripler, taking 432 mc and converting it to 1296 mc. Three watts input at 432 give one watt output at 1296 mc. $? Redline ABC2NP preselector. All band cascode two nuvistor preamplifier, tunes 160 thru 6 meters. $22.95.

Redline DGC- converters. Available for 50, 144, 220 mc. Custom made converters, any specified output frequency. Built in extruded aluminum channel for double shielding. Designed to thwart images, cross-modulation. All nuvistorized (six). Can be used as is or mounted on 3" rack panel. $98.50. Power supply for DGC converters with voltage regulation, special filtering. $49.50.

Redline HJC-50 converter. Broadband converter for 50-54 mc. Nuvistor front end. Output 14-18 mc. Crystal controlled. Requires separate power supply or can be powered from receiver. $31.95. Matching power supply with mating plug. Model HJS $9.95. Redline HJC-144 converter, 144-148 mc, crystal controlled converter, nuvistor front end, output 14-18 mc. Built in power sup-

SBE

Sideband Engineers Inc.
Rancho Santa Fe, California

Model SB-33 sideband transceiver. Selectable single sideband on phone segments of 75-40-20-15 meters, transistorized except for higer power rf stages, final 2-PL500's. 2.1 kc Collins mechanical filter, ac power supply and speaker built in, 5½"H, 11¾"W, 10¼"D, 15 lbs. $389.50. DC to ac inverter $59.50.

Sonar

Sonar Radio Corporation
73 Wortman Avenue
Brooklyn 7, New York

Four Bander. Sideband transceiver for 15-20-40-75 meters, 200 watts PEP, 180 watts CW, xtal calibrator; connections for phone patch, Q-multiplier, sidetone, break-in CW. $495. AC supply $99.50. AC supply with speaker $135. DC supply $135.

Monobander. Individual transceivers available for all amateur bands 80-10 meters, VOX, PTT, S-meter, AMC, 2.1 kc Collins mech. filter. $395.

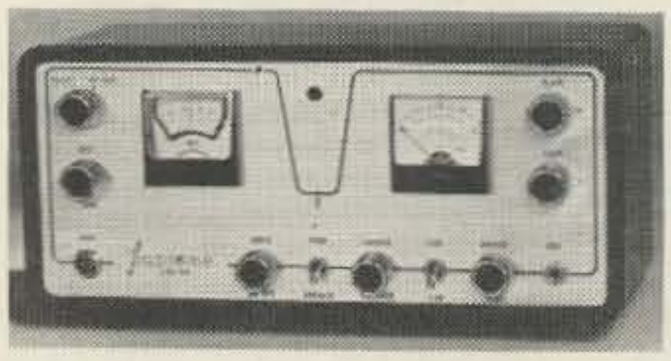
Steel Tex

Steel Tex Electronics, Inc.
30210 West 8 Mile
Farmington, Michigan

The W8IRO terminal unit connects to receiver speaker and printer magnets for no control TU operation. Built-in power supply, pre-set mark and space, limiting circuit. Price: $25.00.

Supreme

Supreme Electronics Inc
Front and Main Streets
Upland, Pennsylvania



SSB-6B six meter sideband transmitter. 75 watts PEP, 8 watts AM, McCoy crystal filter, 50-54 mc, VFO covers 50.0-50.3 mc, 6146 output. Separate power supply required. $289.50.
SB6-LA six meter linear amplifier. 32 watts drive required, 3-400Z 2000 watts PEP input, 600 watts AM, requires power supply, 15"W, 6½"H, 9"D, 15 lbs. Fully metered. $229.50.
PS-1 matching power supply, solid state, $199.50.

Swan

Swan Engineering Co.
Oceanside, California

The SW-240 is an 80, 40 and 20 meter transceiver with 240 watts PEP SSB, 200 watts CW, 60 watts AM to a 6DQ5. Pi-net, AGC, 15 tubes, crystal bandpass filter. Size: 5½ h, 13 w, 11 d. Weight: 12 lbs. Price: $320, SW-12DC supply $115, SW-117AC supply with speaker and cabinet $95.

Tecraft

The Equipment Crafters
Box 84
South Hackensack, N. J.

The Criterion converters are available for 50-54, 144-148 and 220-225 mc. Outputs available from 6-50 mc, built-in power supply, 2 tubes, 2 nuvistors, 4 mc flat bandpass. Price: $49.95.

The Tecraft transmitters are available for 50, 144 and 220 mc. All include one crystal and have 6360 final at 20-25 watts input. Plate modulation, less power supply. Price: $59.95, power supply $39.95.

TMC

The Technical Material Corporation
Mamaroneck, New York

The GPR-91 communications receiver covers .54-31 mc in 6 bands with calibrated 160-10 bandspread. 1 uv sensitivity, 250 cycle to 15 kc selectivity, crystal calibrator, noise limiter, dual conversion, S-meter. Size: 10½ h, 19 w, 14 d.

Topaz

Topaz Transformer Products Inc.
3802 Houston St.
San Diego 10, Ca'ifornia

The 300XL univerter is a dc/dc converter for 12 volt input and 600, 700, 800, 275 volts + and 50 to 90 volts — output. 300 watts, transistorized, with cable and leads. Size: 6½ h, 5 w, 4¾ d. Weight: 8 lbs. Price: $119.95.

Trans-Pro

Transistor Products Laboratories
263 Bouchard Avenue
Dracut, Mass.

The TM-1 CW monitor uses 4 transistors and 2 diodes to mute receiver output and inject a sidetone. Pitch and volume controls, no alterations to rig, full break-in, also a code-practice oscillator. Size: 4½ h, 4⅛ w, 3½ d. Price: $19.50.

Tri-State

Tri-State Electronics Inc.
2734 Lee Highway
Falls Church, Virginia

The Tri-X 500 transmitter has 500 watt SSB and CW input, 250 watts AM. Built-in power supply, ALC, VOX, anti-trip, pi-network, blower, 7034 final. Solid state p.s., Break-in keying, $795.

Utica

Utica Communications Corp.
2917 W. Irving Park Road
Chicago 18, Illinois

The Utica 650 is a 6 meter transceiver with VFO included. It features 22 watts input to a 2E26, 3 kc selectivity, dual conversion, spotting switch, S-meter, adjustable BFO, built in power supplies for 12 and 120 volts. ANL, push to talk, microphone, ac power cord. Price: $189.95. 12 vdc power cord $3.95.

Vanguard

Vanguard Electronic Labs
190-48 99th Avenue
Hollis 23, N. Y.

The Vanguard Mark 2 walkie-talkie is crystal controlled on 26.5-30 mc channels. 200 mw output, 8 "D" batteries, 24" whip, handset. Size: 6½ h, 11 w, 3¼ d. Weight: 4¼ lbs. Price: $79.98, wired TR-28 kit $24.98 to $54.98. The Mark 3 transceiver is identical to the Mark 2 except for 49.5-54.5 mc frequency coverage. Price: $69.95.

photo V-2

The TNS noise silencer is a combination squelch and noise silencer for home or mobile use. Price: $6.00.

The Model 300 converters use 3 transistors for the VHF bands. 300-B has 50-51 mc in, .6-1.6 mc out, price $8.50. 300-C has 50-54 mc in, 14-18 mc out, price $8.50. 300-D has 144-148 mc in, 50-54 mc out, price $10.50.

The Vanguard nuvistor converter uses a 6CW4 pre-amp and 6U8A converter. .1 uv sensitivity, output on 14-18 mc or .6-1.6 mc. Price: $10.00.

Waters

Waters Manufacturing Company
Wayland, Massachusetts

DUMMY LOAD—WATTMETER
TURN OFF TRANSMITTER WHEN LIGHTED
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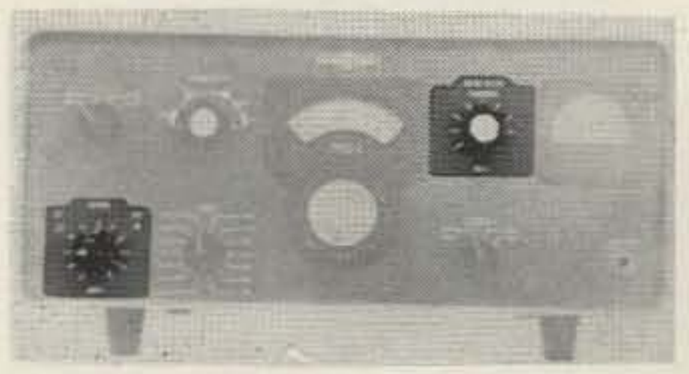
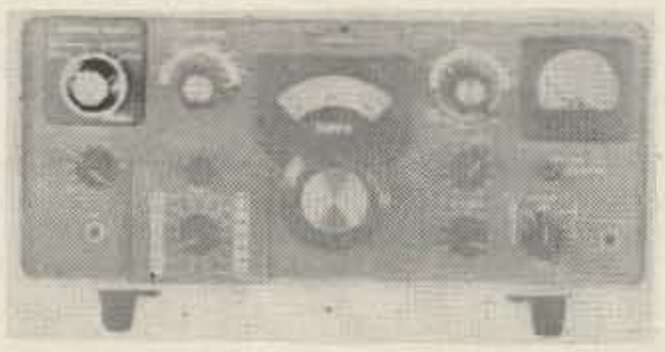
WATERS MANUFACTURING INC. WAYLAND, MASS.

Model 334 Dummy Load. Non-inductive load, 2-230 mc, 52 ohms, 250 watts continuous, 1000 watts intermittent with warning light when load temperature reaches safe maximum. Calibrated scales: 0-10, 100, 1000 watts. 4¾" x 9" high x 10¼" long. 12 lbs. Amateur Net: $79.75.

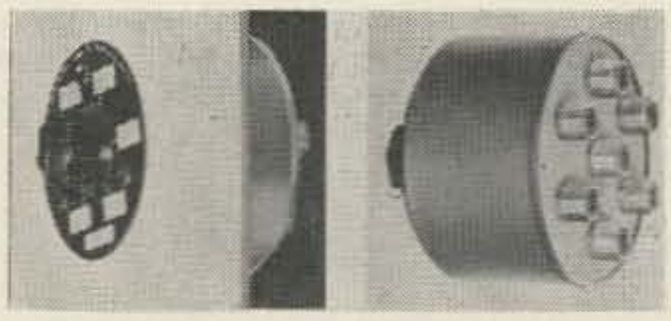
Universal Hybrid Coupler II. Phone patch or tape recorder matching unit with built in compressor and hybrid circuit for sideband operation. Model 3002. Net $69.95. Kit available to modify previous hybrid coupler Model 3001 to 3002: $19.95.



Q-Multiplier/Notch Filter for Collins 75S1. Mounts without damage to equipment, exactly matching. Eliminates heterodynes and unwanted signals from passband. Model 337-S1A for 75S1 $39.95.



Q-Multiplier/Notch Filter for Collins KWM2/2A transceivers. Does same job as above unit. Model 340-A $53.75.



Coaxial Switches. Model 335 (illustrated) switches one pole six position for antenna selection, etc. SO-239 type connectors come straight out rear of switch for ease of cabling. Comes with escutcheon and matching knob. $12.95. Model 341 is a single pole double throw switch and sells for $11.45. Model 336 is a coaxial transfer switch for feeding an exciter to a final or bypassing the final, price $11.45.

Whippany

Whippany Laboratories, Inc.
1275 Bloomfield Ave.
West Caldwell, N. J.

The Li'l Lulu 6 meter transmitter has VFO coverage 50-54 mc, voltage regulation, shaped keying, built-in 12 vdc and 117 vac power supplies, low-pass filter.

WRL

World Radio Laboratories
3415 West Broadway
Council Bluffs, Iowa

The PSA-63 is an ac power supply to power any 50-100 watt transmitter or transceiver. 600 vdc, 300 vdc, or combination to 210 watts. 6 or 12 volt filament windings, 95 volt bias winding. Less cabinet, accessory kits available to modify for use with various rigs. Size: 4¾ h, 6 d, 11¼ w. Weight: 15 lbs. Price: Kit $24.95, Wired $39.95.

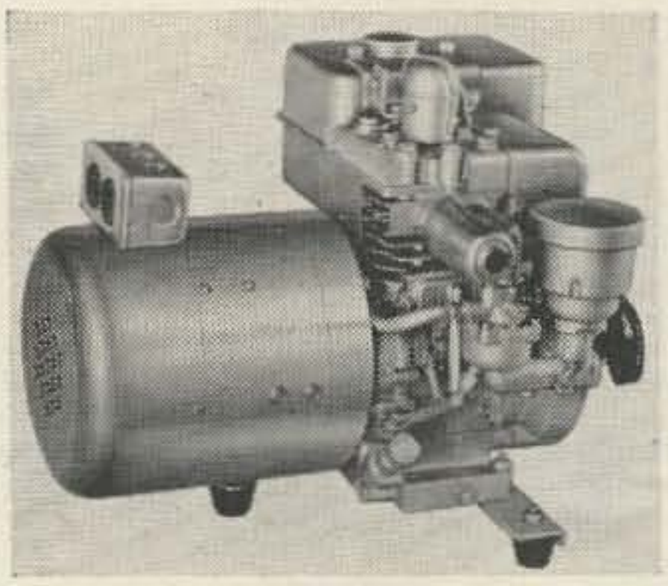
The Galaxy 300 is a 200 watt PEP SSB transmitter for the phone sections of 80, 40 and 20 meters. 2.7 kc selectivity, 35 watts AM, two speed tuning, push to talk, audio AVC, ALC, S-meter, less VOX and power supply. Size: 7 h, 15 w, 13⅝ d. Weight: 27 lbs. Price: $299.95; ac power supply with clock $99.95, less clock $79.95; dc supply $119.95; accessory VOX $19.95; mobile bracket $15.00.

The MM-100 Mini Matcher is an antenna tuner kit for use with transmitters with inputs to 100 watts. Matches 52-75 ohm coax to multiple half wave end fed antennas. Size: 4 h, 5 w, 4 d. Price: $10.95.

The TechCeiver-6 is a 6 meter transceiver with 1 watt output. Crystal controlled, push to talk, plate modulation, 6 tubes, speaker included, less power supply. Size: 5 h, 9¼ w, 6 d. Weight: 5¼ lbs. Price: $39.95, ac supply $15.95.

The SS-3 Q-multiplier kit can be used with any receiver with a 455 kc *if*. Internal power supply, selectivity to 300 cycle peak or notch. Size: 4¼ h, 6¼ w, 4¾ d. Price: $15.95.

The SB-175 Meteor transmitter operates on 80-10 meters with 175 watts DSB or CW, 100 watts AM. Pi-network, audio limiting. Less power supply. Size: 5 h, 12 w, 8 d. Price: $99.95.



The 12A generator delivers 120 vac at 1250 watts full load. 2 pole generator, rope starter, 4 cycle motor, holds 3 qt gas, 1¼ pt oil, air cleaner. Weight: 100 lbs. Price: $149.95.

The SW-59 is a general coverage .54-35 mc communications receiver with calibrated amateur bandspread. Noise limiter, speaker, S-meter, wood cabinet, transformer power supply. Price: $39.95.

The DB-68 pre-amplifier has 3 tubes and power supply for coverage of 80-6 meters. Coax or twin-lead connections. Size: 6¾ h, 6¾ w, 7½ d. Price: $39.95.

If manufacturers have any changes, corrections or additions to this list they are welcome to bring them to our attention. Should this section meet with any great acclaim we will plan on repeating it next fall again.

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351-D2 mntg rack $120

MP-1 dc supply $198

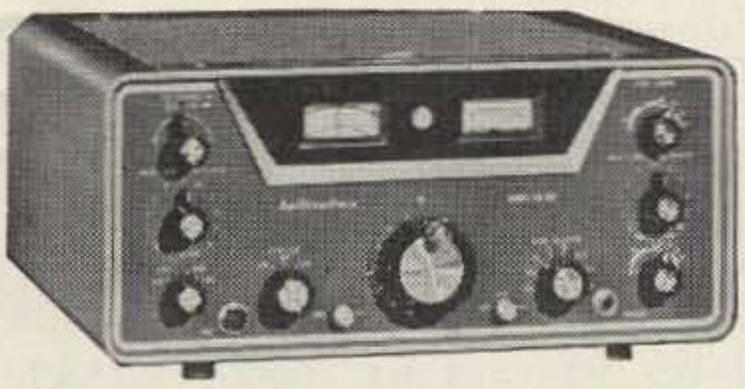
DRAKE

TR-3 $495

AC-3 ac supply $79.95

DC-3 dc supply $129.95

Speaker $19.95



HALLICRAFTERS

SR-150 $650

P-150 ac supply $99.50

P-150 dc supply $109.50

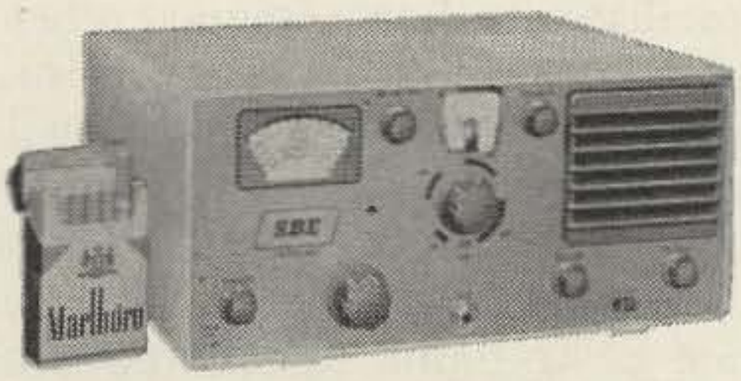
MR-150 mntg rack $39.95

NATIONAL

NCX-3 $369

NCX-A ac supply $110

NCX-D dc supply $119.50



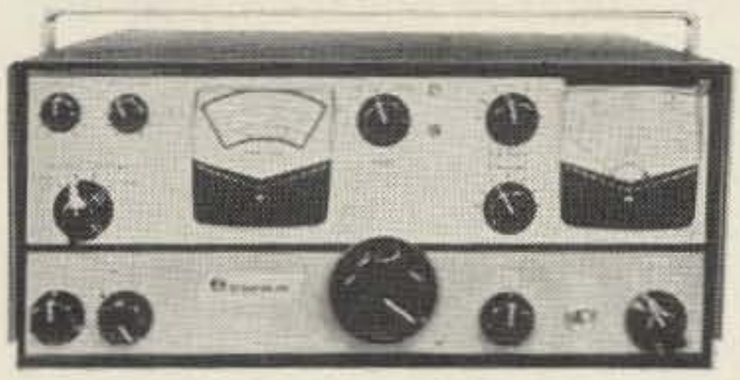
SBE

SB-33 $389.50

ac supply built in

dc supply $59.50

mntg rack $12.50



SWAN

SW-240 $320

SW-117 ac supply $95

SW-12 dc supply $115

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Johnson 6N2 xmtr w/VFO, PS & mod.	179.00
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Johnson 122 VFO	19.00
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National SW54 Rec	24.00
National NC 109 Rec	89.00
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National NC 300 Rec	159.00
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RME 6900 Rec w/spkr	189.00
Seco xsistrized S-meter	5.00
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Gonset G66B Rec w/12v supply	99.00
Gonset GSB101 Linear	199.00
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Gonset Commander xmtr w/VFO	39.00
Hallicrafters HT32 xmtr	349.00
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Hallicrafters SX101 Mk III A Rec w/spkr	199.00
Hallicrafters S 108 Rec	99.00
Hallicrafters S 119 Rec	29.00
Hammarlund HQ 110 Rec	139.00
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Product Detector

Jim Kyle K5JKX
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Oklahoma City 11, Okla.

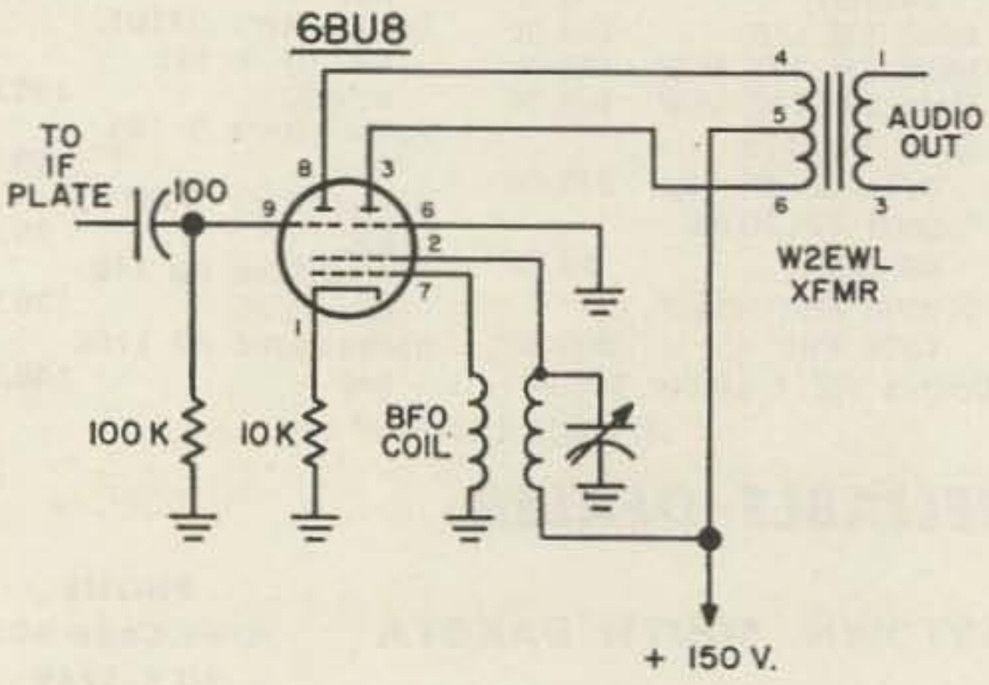
By now almost everybody should be aware that a product detector of some sort is essential for best copy of either CW or sideband signals, to eliminate (or at least reduce drastically) detector distortion and to allow strong signals as well as weak ones to be received.

A host of product-detector circuits are in print; some time ago, we summarized most of them in these pages—and few new ones have appeared since.

At that time, we came to the conclusion that the sheet-beam type of detector had much to offer. Its major disadvantages were the requirement for a special tube (type 7360) and the need for push-pull input for either the *if* signal or the bfo.

But we kept playing with it at odd moments, and took some hints from here and there. The result—a somewhat unusual product-detector circuit which uses only one tube (a TV-replacement variety at that), has high-impedance single-ended input for the *if* signal, and contains its own bfo. Audio output as well is single-ended, and the bfo signal does *not* appear in the output.

The circuit (see schematic diagram) is a blend of standard sheet-beam configuration with a 6BU8 "split pentode" substituted for the true sheet-beam tube, and the "long-tailed pair" phase inverter from the hi-fi realm.



Note the 10K cathode resistor which must not be bypassed. This provides the phase inversion which allows the circuit to act in sheet-beam fashion. At first we were a bit dubious about this, but none of our fears proved justified in practice.

For those of you who may be curious about the 6BU8, it is just a normal pentode except for one thing: it has a pair of suppressor grids and a pair of plates, sharing a common screen, control grid, and cathode. This tube is used quite widely in certain keyed-agc TV circuits, and as a result is more easily obtained in many localities than the special 7360.

Here's how the circuit works. The common screen and control grid are used as plate and grid, respectively, of the bfo. While a tuned-plate feedback oscillator is shown, several other types should work as well. This part of the circuit is almost identical to the conventional electron-coupled oscillator used in VFO's, and modulates the current of both plates by the same principle.

In the absence of *if* input signal, the bfo signal reaches both plates in equal amount and cancels itself out in the push-pull transformer.

One suppressor grid is grounded and the other receives the *if* signal through a coupling capacitor and return resistor. As the *if* signal comes in, it changes the plate current of the upper half of the tube and this in turn changes the voltage drop across the cathode resistor. This change in cathode voltage is an effective change in suppressor voltage in the lower half, and push-pull action at the plates is thus obtained.

Since the bfo is driving the tube to cutoff and saturation on each cycle, it is a non-linear device and the proper mixing or demodulating action is achieved. Since the *if* signal is effec-

tively in push-pull, the demodulated audio is also push-pull and so appears in the transformer secondary.

With normal *if* signal levels, audio output of the circuit shown (using the tiny "W2EWL" transformer) is approximately 10 db greater than the output of a simple diode detector.

The circuit appears to offer excellent isolation of bfo voltage from the *if* strip. In an experimental receiver, with avc active on either AM or SSB modes, the avc voltage did not vary any measurable amount with the product detector switched on or off.

It is essential to keep the screen voltage somewhere close to 150 in this circuit. At lower voltages, the oscillator won't produce enough output to handle strong input signals, while at higher voltages the tube shows a tendency to "lock up." Regulation is not necessary, though, except to assure bfo stability if this is a problem for you.

Distortion is not audible with the strongest input signals. For sheer simplicity combined with excellent performance, we feel this circuit will be hard to beat. . . . K5JKX

Improved Coaxial Fitting Installation

For those of us who are fortunate enough to be employed in the electronics field, the free sample road has another new path to follow. A 12 inch free sample of the new shrinkable plastic sleeving is something any of the vendors of the product will be glad to donate.

This foot of tubing, worth only a few cents, can be used to make a coaxial fitting installation without a peer. Cut it into four inch lengths, slide it over your coaxial fittings which will be required to brave the elements, heat it with a hair dryer, or even carefully with a blowtorch, and it will shrink up neatly around the fitting and the cable, resulting in a fitting which will not take on water in the worst weather, and which is almost impossible to pull apart. If you coat the cable outside the fitting area with Pliobond (or another rubber-type cement) before you seal it, it is almost indestructible. Summers' rain and winters' ice can't get in, and can't pull apart coaxial fittings done this way.

Ham distributors may soon have this as an over the counter item, making this trick available to all. . . . W8BPY

COMING SOON ANOTHER FIRST

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NO TVI

NO SUCK OUT

COUPLES TO ANT FEED LINE

OUTPERFORMS POPULAR 101 (See QST Jan. 1963)

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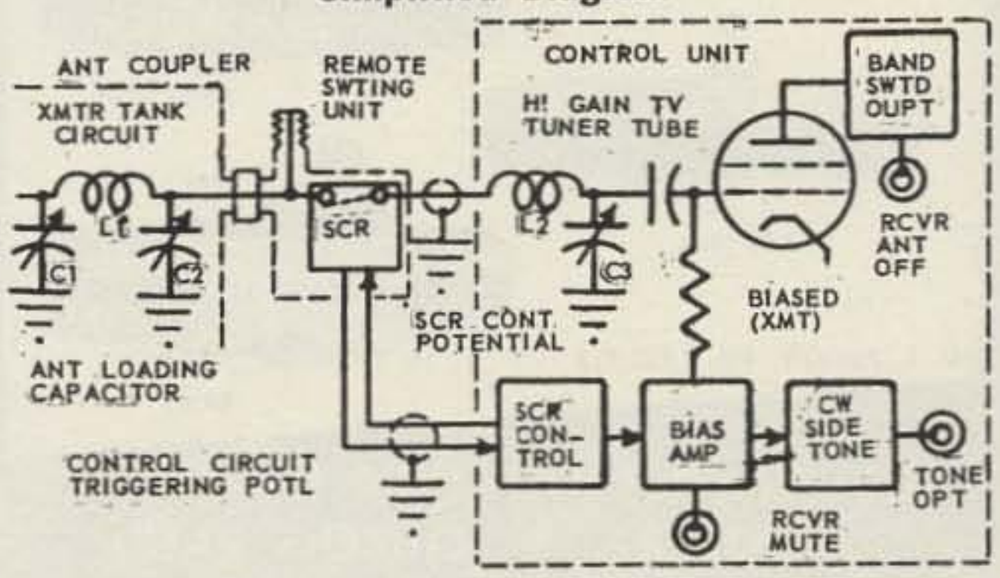
Simplified Diagram



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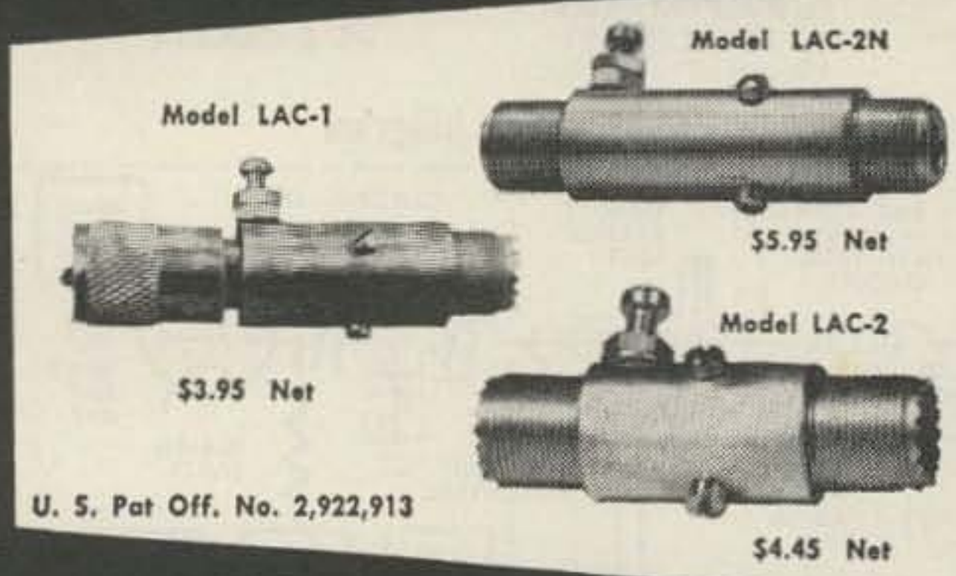

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Economical Mobile Transceiver Construction

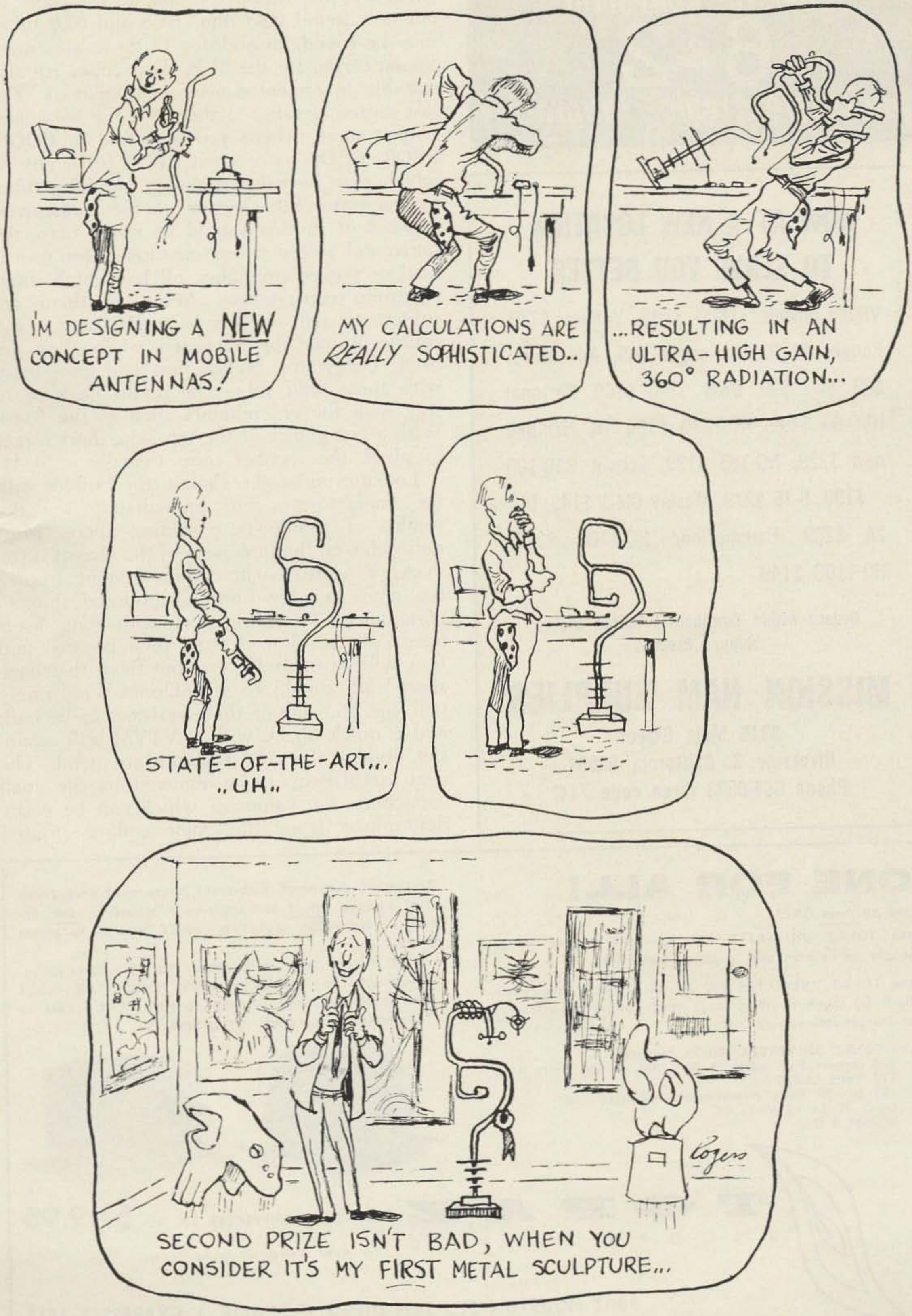
Michael Watson K5MWH
150 Cabaniss
Baytown, Texas

Many of us, from time to time, feel the urge to build our own equipment. However, when the cost of such a building project is considered we are all inclined to forget the whole thing and go call CQ 75. Be not dismayed! Things are not as bad as they may first appear.

Recently a group of local amateurs decided that the time to change to sideband mobile operation had come. After studying several schematics, one was chosen that appeared to suit our needs. Layouts and parts lists were decided upon and the rush for parts was on.

Naturally no self respecting cheapskate would buy all the necessary parts for a project of this size; therefore another source had to be found. It was decided that, if chosen with care, used parts would be suitable. What! Used parts? Those of you not now turning to the next article can start thinking about those precious dollars you may be about to save.

Many of you are familiar with the bargains available in used or discarded TV receivers. Here my friends is the source of numerous usable items, which if bought new, would cost quite a sum of money. One of the most useful items to be found in these TV receivers is of course the tubes. Most TV receivers contain a wide assortment of tubes that can be put to use in amateur equipment. Tubes such as the 6BA6, 6AU6 and 6CB6 are found in the audio and video *if* stages of almost every TV set now available and are useful in receiver rf and if stages. 6AQ5 and 6V6 tubes found in TV audio output stages can be used for the same purpose in home built equipment. The horizontal oscillator, sync, AGC and vertical oscillator sections of the TV set may contain tubes of the 6U8, 6EA8, 12AU7 and 12AX7 types which can be used as audio amplifiers, product detectors, carrier oscillators and speech amplifiers. Let us now take a look at the video amplifier section of the TV receiver. Here are found such goodies as the 6CL6, 12BY7 and 6AG7 which are all excellent for use in driver stages of the exciter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Phone 683-0523 (area code 714)

portion of the transceiver and in the tuner of our new found gold mine 6U8 and 6X8 tubes may be found. In addition to those uses mentioned earlier for the 6U8, these tubes are also suitable in oscillator-mixer combinations. The last source of tubes in the set is the horizontal output stage, where you may find a: 6DQ6; 6BQ6; 6CD6; or even a 6BG6 tube, any of which may be used as power amplifier tubes in the transmitter section of the transceiver. A word of caution should be noted here; the horizontal sweep tubes mentioned for use as final or power amplifiers, all have high inter-electrode capacitances. Many of them are subject to self oscillation in HF stages and caution should be exercised when they are used. Unless the builder has had experience with these *wild* tubes, he might be wise to stay with the old reliables such as the 6146. With a last glance at the top side, don't forget to pluck the rectifier tube (usually a 5U4).

Looking under the chassis, the builder with the trained eye will immediately see the wealth of usable parts hiding there. Most noticeable on the underside of the chassis is the maze of resistors with values ranging from a few ohms to a few hundred thousand ohms in abundance. Those resistors with long leads need only be clipped from their position and they will be ready for use, but those that have short leads should be un-soldered. Very rarely will one find any of these resistors to be bad, and a quick check with a VTVM will assure the builder that the resistors are good. The next useful items to be removed are the small capacitors, the values of which can be easily determined from the color coding printed

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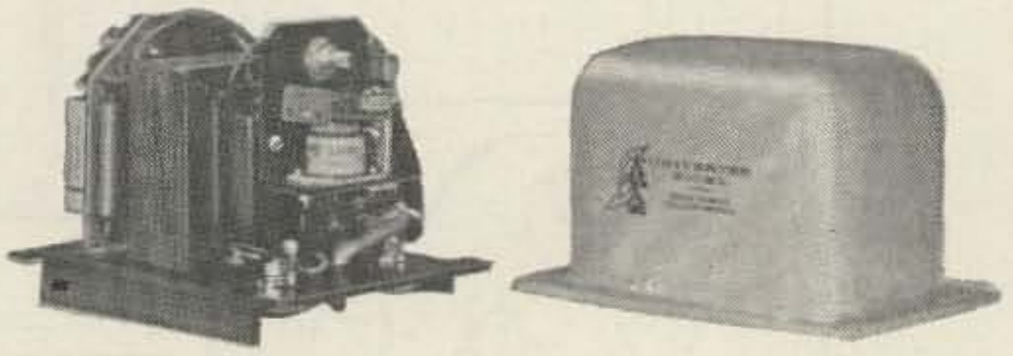

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on each one. The same precautions should be exercised in removing these capacitors and all small parts as was noted in removing the resistors. The large tubular capacitors in these TV receivers may also appear to be useful, and many of them are; however, caution should be observed when selecting this type of capacitor for reuse: those that are made of plastic or ceramic are good and should work very well; but any wax impregnated, paper capacitor should be discarded as they are subject to leakage and shortage. Always check tubular capacitors for shortage with a VTVM before it is used.

Now comes the main course in our meal of salvaged parts for hiding in each of those *if* transformer cans are the most useful parts to be taken from the TV chassis. Each transformer is wound on a one quarter or three eighths inch coil form. All of these coil forms can be stripped and rewound for use in any tuned circuit and then be put back into the aluminum cans where they will be shielded from stray fields. By now the chassis should be nearly clean. The tube sockets should be cleaned with a soldering iron and removed from the chassis.

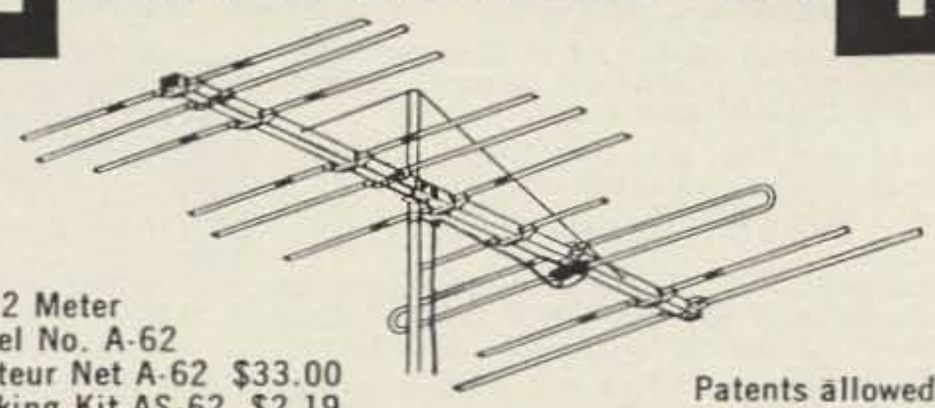
If you remember in the first part of this article I mentioned the use of the audio output tube. Very close to this tube a three to five watt audio output transformer will usually be found. A quick check with an ohm meter will tell us if the windings are good and they usually are. The transformers work as well as new ones but don't forget to keep those leads as long as possible.

If the TV receiver is of the type that uses a focus coil, you will find this coil will contain hundreds of feet of wire useful on those coil forms that were removed earlier. The focus coil is a round, flat object that fits on the neck of the picture tube and has a metal case around it. Inside the metal case the wire is usually wound on a plastic spool which will serve for storage. While on the subject of wire, let me remind you that there are many feet of hook-up wire in long and short lengths that can be removed and put to good use. Hook-up wire is cheap until one starts buying it for a large project.

On the front and rear of the chassis are numerous potentiometers which range from low values of a few hundred ohms to the megohm range. All of these controls can be checked with a VTVM and marked with a grease pencil.

Finally, if the receiver is of the power transformer type, remove the transformer, again being careful to keep all leads as long as

2 ANTENNAS IN 1



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possible. Power transformers of this type usually have a five volt winding and two or three six volt windings in addition to the high voltage secondary. Most of the filament windings will deliver from the three to five amps and the high voltage secondary will give around 280 volts at 200 to 300 ma under load. Also near the power transformer should be found a small filter choke whose value will usually range from two to five henrys and will handle approximately 200 to 300 ma.

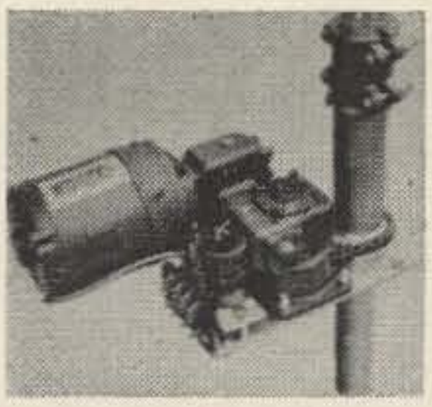
The chassis should now be free of most usable parts. Make a final check to see that nothing of value has been overlooked. All of the salvaged parts should be put into boxes where they will be ready for use. As mentioned before, the search for an economical source of parts was prompted by our desire for several mobile SSB transceivers. Presently, two of the rigs have been completed and are in use and three more should be ready soon. All of these units have used parts in them and no difficulties have been encountered as a result of the used parts. Of course, one does not rely completely on used parts, parts for critical stages such as VFO's should always be new and of highest quality.

Many TV shops throw away old sets that can not be fixed for resale. By keeping a sharp eye out, the builder may locate a number of sources of discarded TV sets. Finally let me issue to one and all a word of caution: if possible, TV sets without picture tubes should be obtained. *TV picture tubes are very dangerous!* If they are dropped or receive a hard blow, they may implode sending thousands of small pieces of glass in all directions. These pieces of glass travel with great speed and can be *flying death.* Be careful, good hunting, and I hope to hear that new transceiver soon.

. . . K5MWH

Institute Museum

If you have any ham gear circa the mid or early thirties please make arrangements so it won't be junked when you leave us. We'd sure like to have it for display in the museum here with your QSL on it.



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Europe!

Tally Ho

The big trip to Europe will be leaving Idlewild October 6th at 10 PM. We'll all be gathering in the BOAC departure rooms at about 8 PM and checking it. Sorry if you didn't take us up on this one, we're going to have a lot of fun. We'll be back the 28th. If you want to drop any notes to the group we'll be picking up our mail at the American Express offices at each city on the route. Drop mail to Wayne Green, c/o American Express, London, Paris, Geneva, Rome, and Berlin. London the 10th, Paris the 15th, Geneva the 18th, Rome the 23rd, Berlin the 25th. Allow plenty of time for the mail, I'll pick it up on the specified days.

It would surprise me no little and quite some if we didn't have a fairly good article on the trip by and by to help those of you who procrastinated on this one to eat your hearts out.

Tour Cancellation

One couple that had planned to go on the tour suffered a last minute sickness which forced them to cancel. This means that we have two spots open if any of you would like to make a last minute decision to go along. We leave from Idlewild October 6th and return the 28th, total cost of trip for all air flight, bus travel to and from airports in Europe and hotels with breakfast is $550 each, which is considerably less than the $630 round trip economy fare to Rome. We'll visit four days each in London, Paris, Geneva, Rome, and Berlin. Call if you would like to climb aboard.

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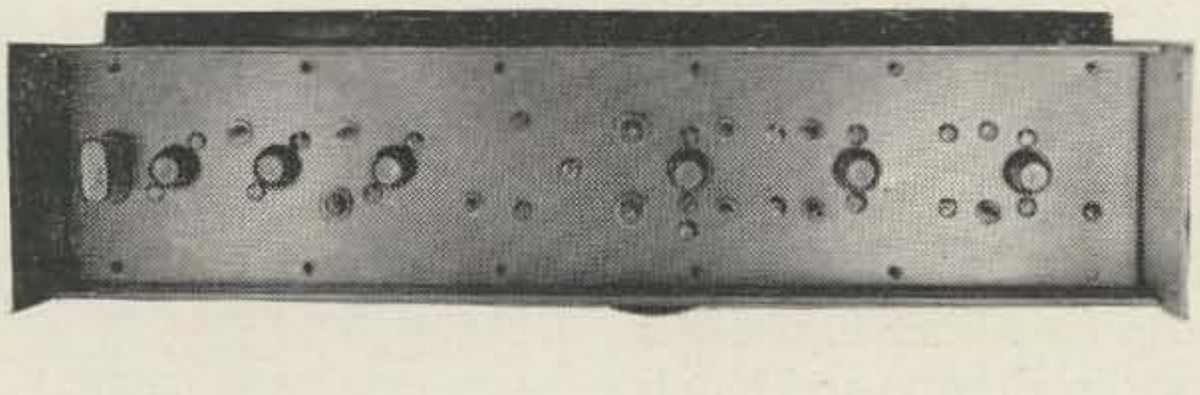

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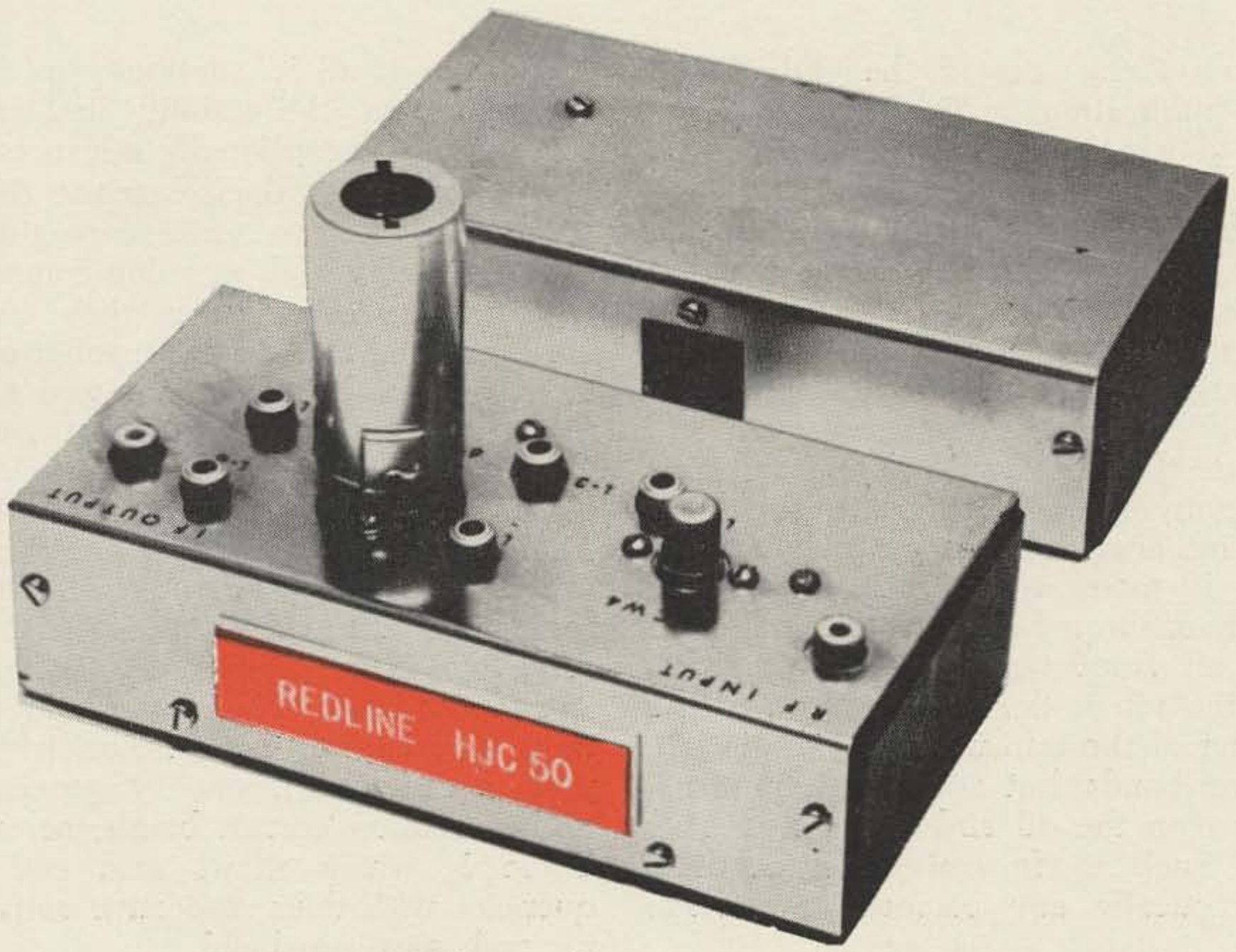
Have you ever considered what goes through a manufacturer's mind when he sits down to make a new product?

1) What is the demand for this product?
2) What products are already available to meet this demand?
3) How can your product be better than the others?
4) Where do you draw the line between cost and performance?

Being active on the VHF's, we thought we knew the answer to #1. We then set about checking everything available for overall gain, bandwidth and noise figure. One manufacturer was way ahead of all the others; this is the one we would have to beat. Fortunately this company doesn't seem to believe much in advertising so we felt that we would have a considerable edge on them by having both a better product and a better advertising campaign.

By building the best converter possible with today's components and giving no consideration whatever to price we were able to make a unit that would outperform everything else available. Each unit is individually tested and aligned for the best possible noise figure and we achieve a better NF than the others even claim!

Actually the design of the ultimate converter wasn't nearly as difficult and time consuming as the design of our economy converter, the model HJC. Here we were attempting to outperform the most expensive converters on the market and still keep the price down below most of the inexpensive converters. This took a lot of doing, but we've done it. We give you a money back guarantee that the HJC converter will let you hear weaker signals than any other converter on the market except our expensive DJC model. Fair enough?



Not everyone wants to hear every last signal on the band. Particularly for $98.50. Our model HJC-50 will (money back guarantee) outperform any other converter on the market, regardless of price (except the DGC).

HJC-50 ..... $31.95

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REDLINE

JAFFREY, N. H.

A Novel Type High Capacitance VFO

Tima Popovich ex-YU1FR
Banat, Novo Selo
Yugoslavia

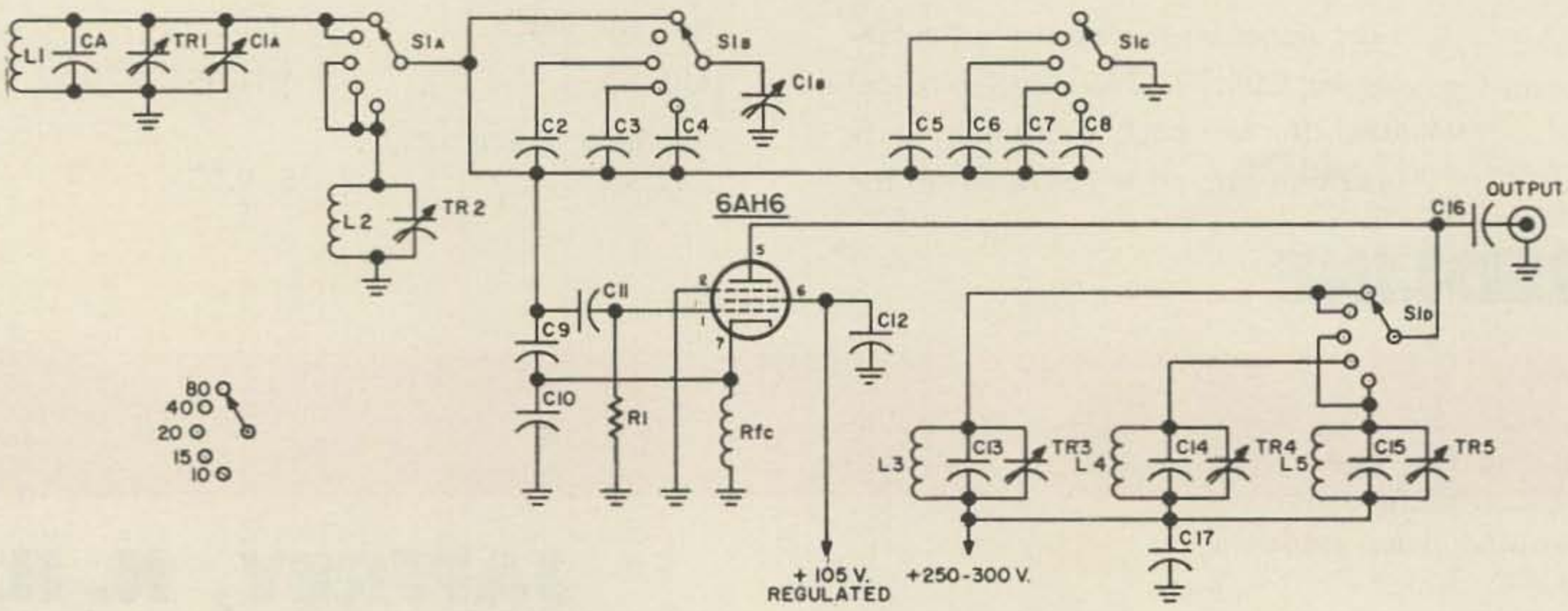
The March 1962 issue of the "DL-QTC", the official publication or DARC, brings the description of a novel type high stability vfo with high capacitances, developed by G.G. Nierbauer DJ2XP which we are presenting in the following article in a new form, adapted to American standards.

The unit includes a number of remarkable features that make it quite attractive to the amateur builder. It's simple to construct and requires parts that are handy in the junk box of almost every radio amateur. A one knob bandswitching array assures coverage of the 80 through 10 meter amateur bands, while a large directly calibrated dial provides full band spread on all frequencies. The output frequency of the vfo is the same as that of the final amplifier of the transmitter on the 80, 20 and 15 meter bands, but doubling is required for operation on the 40 and 10 meters. This means that such a vfo can be successfully used in practically any compact two stage transmitter.

In spite of all its simplicity in construction and operation, the stability and efficiency of the unit are exceptionally advanced.

A reference to the schematic diagram will show that the two series capacitors C9 and C10, unusually high in value compared to the tube internal capacitances they are shunting, are connected in the same manner on all bands to avoid tube effects on the grid tank circuit, thus providing a good stability. On the other hand, the parallel tuned grid tank circuit assures a constant power output over a broad frequency range, which is not the case with the well known Clapp circuit, for example, resulting in a smooth excitation of the following stage, which in turn makes for better efficiency.

The oscillator tube, for which a 6AH6 is most convenient, doubles or triples in the plate circuit the frequency generated in the grid circuit on certain bands, as explained in Table 1, which shows grid and plate frequencies with their respective active elements for each particuar band.



New Products

Super-Q

A new manufacturer has entered the beam antenna field with a six and ten meter beam. The six meter beam has six elements on a 15 foot boom which is slightly arched to compensate for the sag one would normally expect in an antenna of this length. There is some weight to be reckoned with too, for the elements are all one inch aluminum which should result not only in a very sturdy and long lived beam, but should give a wider bandwidth than beams with smaller diameter elements. Plastic caps are provided for all elements. Claimed gain is 11.2 db over a dipole with a front to back ratio of 25 db. Beam width 42°. Match is a trombone gamma type and is factory adjusted to match RG-8/U. It can be tuned for variations in coax impedance or beam impedance due to height above ground. Price is only $27.95. Super-Q Products, 3363 Verner Road, Kent, Ohio. Their three element ten meter beam is $29.95 and is equally solidly built. Send for info to the manufacturer and watch for their ads.

VHF Gear

Amplidyne Labs has announced three additions to their line of VHF equipment. The model 126 three band converter (left) covers 50-144-220 mc, has built in power supply, nuvistor front end, grounded grid, four i-f outputs to meet your needs. $94.50. The model 621 transmitter (center) covers both six and two meters, 8150 final running 60 watts. Xtal controlled or external VFO. Built in dummy load, grid bias supply for final protection, all stages metered, including rf output, AM or CW operation, PTT. $229.50. Model 221 220 mc adapter puts you on 220 mc with 18 watts AM or CW when driven by #621. Uses 621 power supply, modulator and metering circuits. 6360 final. $72.50. This means that you can operate on all three VHF bands with complete converter and transmitter for a combined price under $400! Amplidyne Labs, Box 673, Kings Park, L.I., N.Y.

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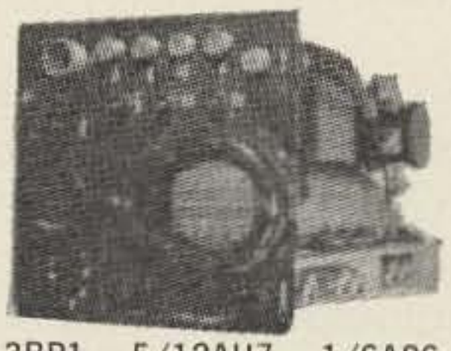

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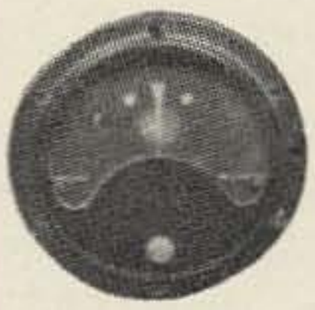

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Letters

Wayne,

W3AQT's decision, "I will not spend any more money for your magazine," struck me as being an interesting attitude. Since October 1960 I've been buying several copies of each issue in addition to my subscription copy: one copy, the one with no wrinkles, goes into the historical file. The others are handled and passed around. The competition? One copy per each.

Ted Shaw W6AVN

Dear Wayne,

". . . how come you are making obeisance to CQ and K6BX by including Greene County on your QSL? Is this an olive branch being extended?"

K5BBA

I understand that they have decided not to count Greene County New Hampshire toward the CQ awards. I think that is pretty small, don't you?

Should the vfo be connected to the following stage by means of piece of 52 ohm coaxial line not exceeding 2 inches in length, the correct value for the C16 capacitance is around 200 mmfd. With a longer line (2-6 inches), a 100 mmfd capacitor is more profitable.

Alignment

An accurately calibrated receiver or a good grid-dip meter will do as an adjusting instrument.

80 m Set C1 to maximum capacity, tune TR1 to 3,510 kc; then turn C1 to minimum capacity. The oscillating frequency should now be brought to 3,750 kc.

40 m TR1 remains untouched, while C1 should be set to maximum capacity. Should the oscillator frequency lie under 7 mc, the capacitance C5 has to be changed to 430 mmfd. Should, on the contrary, the oscillator frequency be higher than 7 mc, the value of C5 should be increased to 470 mmfd. Now turn C1 to minimum capacity and bring the oscillator frequency to 7.3 mc. The operation should be repeated several times, readjusting again and again the active elements, until the tuning range of the vfo settles between 7 and 7.3 mc.

20 m Turn C1 to maximum capacity and adjust the oscillator frequency with TR2 to 14,010 kc. Then set C1 to minimum. Should the oscillating frequency be higher than 14,350 kc, the value of C2 has to be changed to 100 mmfd. Now turn C1 to maximum again and readjust the frequency with TR2 to 14,010 kc.

15 m TR2 remains untouched: C1 is set to maximum. Should the oscillator frequency lie under 21 mc, C7 has to be increased to 330 mmfd. Now turn C1 to minimum. Should the oscillator frequency be higher than 21,450 mc, the value of C3 is to be changed to 90 mmfd. Then turn C1 again to maximum and readjust the oscillator to 21.0 mc.

10 m TR2 remains still unchanged. C1 set to maximum capacity. Should the oscillator frequency lie under 28 mc, C8 should be decreased to 240 or 230 mmfd. Now turn C1 to minimum. Should the oscillator frequency be higher than 29.7 mc, the value of C4 should be decreased to 450 mmfd.

C1 is now to be set again to maximum and the oscillator adjusted to 28.0 mc. Should the frequency lie under 28.0 mc, C8 has to be decreased to 220 mmfd.

It is quite desirable to connect an air trimmer across each of the capacitances, from C2 to C8, in order to facilitate finding out the correct C values for each particular band, without being obliged to solder in and out an excessive number of small capacitances.

The plate circuit is to be adjusted as follows:
80 m: Bring TR3 to maximum output at 3.65 mc.
40 m: TR3 unchanged.
20 m: Bring TR5 to maximum output at 14.3 mc.
15 m: Bring TR4 to maximum output at 21.25 mc.
10 m: TR5 unchanged.

Power requirements are quite small: 6.3 volts at 500 ma for the filament and 150 to 250 volts at 15 ma for the plate. Stabilization is needed for the screen grid voltage.

. . . YU1FR

Transmitter output	Grid circuit Tuning range	Grid circuit Active elements	Plate circuit Oscillator output	Plate circuit Active elements
3.5 to 3.8 mc	1.75 to 1.90 mc	CA, C1A, C1B, C9, C10, TR1, L1	3.5 to 3.8 mc	C13, TR3, L3
7.0 to 7.2 mc	1.75 to 1.80 mc	CA, C1A, C5, C9 C10, TR1, L1	3.5 to 3.6 mc	C13, TR3, L3
14.0 to 14.4 mc	7.0 to 7.2 mc	C1B, C2, C6, C9, C10, TR2, L2	14.0 to 14.4 mc	C15, TR5, L5
21.0 to 21.45 mc	7.0 to 7.15 mc	C1B, C2, C7, C9, C10, TR2, L2	21.0 to 21.45 mc	C14, TR4, L4
28.0 to 29.8 mc	7.0 to 7.45 mc	C1B, C4, C8, C9, C10, TR2, L2	14.0 to 14.9 mc	C15, TR5, L5

Table 1

Parts List

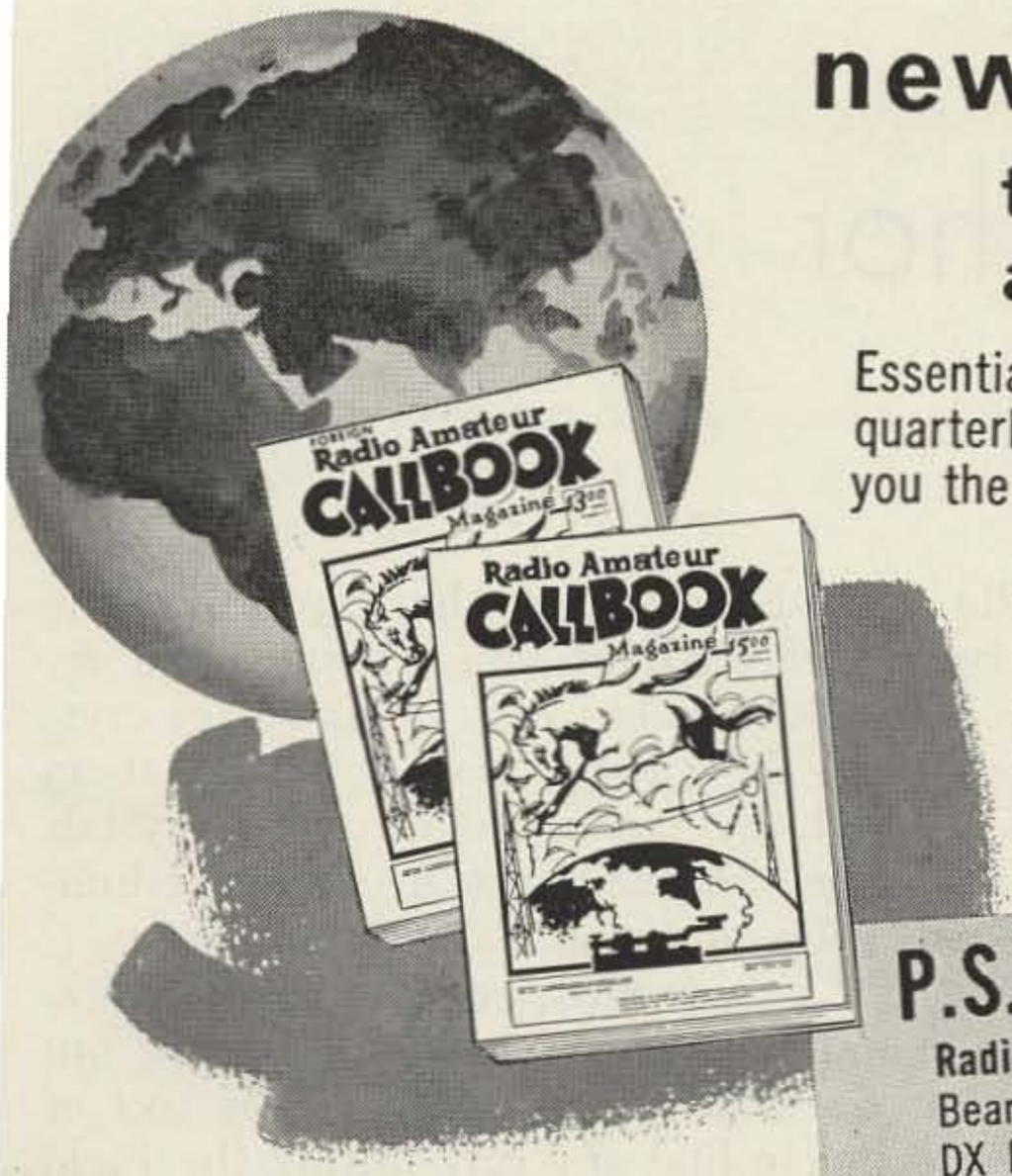
C1A, C1B-15-	450 mmfd (conventional two gang variable)
C2	120 mmfd ceramic
C3	100 mmfd ceramic
C4	500 mmfd ceramic
C5	450 mmfd ceramic
C6	300 mmfd ceramic
C7	320 mmfd ceramic
C8	250 mmfd ceramic
C9	2000 mmfd mica
C10	2000 mmfd mica
C11	200 mmfd ceramic
C12	2000 mmfd ceramic
C13	30 mmfd ceramic
C15	20 mmfd ceramic
C16	see text
C17	2000 mmfd paper
CA	2000 mmfd ceramic or mica
TR1 to TR5	50 mmfd air trimmers
R1	50 K 1 w
S1A to D	4 pole, 5 position ceramic switch

Reference

G. G. Nierbauer, DJ2XP, "VFO mit hohen Kapazitaten," Das DL-QTC, March, 1962, page 114.

Coil Data

L1-3 μh— 17 turns #18 (B&S) wire, ½" diameter ceramic form, one inch winding length.



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coil data, continued

L2-0.4 μh— 4 turns #16 (B&S) wire, ½" diameter ceramic form, 11/16" winding length.
L3-30 to 70 μh— about 30 to 40 turns #24 to #32 (B&S) wire, ⅝" diameter ceramic form, close wound.
L4-1 to 2 μh— 12 turns #24 (B&S) wire, ⅜" diameter ceramic form, ⅜" winding length.
L5-1.5 to 3 μh— 18 turns #24 (B&S) wire, ⅜" diameter ceramic form, close wound.
RFC-1 mh— RF choke.

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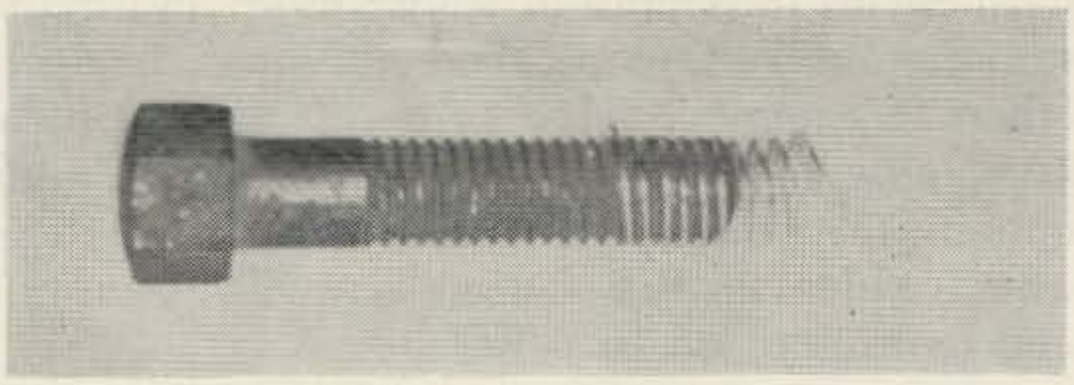

from your junkbox. After consulting the chart below, wind the wire on the screw or bolt threads for as many turns desired. Then to remove the coil, simply unscrew the screw or bolt from the wire . . . and you will have a neat and accurate inductance.

Diameter	Threads Per Inch Coarse	Fine
1/4 inch	20	28
5/16 "	18	24
3/8 "	16	24
7/16 "	14	20
1/2 "	13	20
9/16 "	12	18
5/8 "	11	18
3/4 "	10	16
7/8 "	9	14
1 "	8	14
1 1/8 "	7	12
1 1/4 "	7	12
1 1/2 "	6	12

. . . W3WTO

73 test the

Clegg Thor

Wayne Green W2NSD/1

As mentioned in the editorial last month, the Clegg Thor was given a good stiff workout at our new VHF HQ station during the June VHF ARRL QSO Party. Frankly, it was a spectacular improvement over anything we've ever used before.

The Thor is a six meter transceiver that provides full VFO operation on the received frequency over its entire range of 50-52 mc. This is all that is needed for practical operating purposes, with nothing much inhabiting the higher regions of the band except wide band FM nets which wouldn't be contacting a Thor anyway. Even under the most crowded band-open conditions you seldom hear more than a few stations venturing above 51 mc and those seem to be on popular surplus crystal frequencies only.

The Thor's ability to transmit on the received frequency (and vice versa) is helping to make six meters a lot more like the lower frequencies in operation where more and more stations are VFO controlled and stick to each others frequency. This type of operation is invaluable in contest work and during band openings. As more and more stations tune their own frequencies first I think we will find more and more demand for VFO's.

During this last contest I found I was able to run rings around some of the rock-bound stations. One, parked on top of a nearby mountain with his kilowatt and big beam, was very frustrated because he would call CQ (rock-bound) and the station answering him would come back on his frequency. This was OK until he signed and then I came in loud and clear on the channel calling the station he had just worked. Though the Thor is no kilowatt, its 40 or so watts output raise hob on a frequency for a hundred miles or so and he had to give up and change crystals to keep working. He found this out the hard way by trying over and over to drown me out. I don't drown.

The Thor has a crystal socket on the front panel and can be simply switched to crystal operation of the transmitter. This is very handy for calling CQ or working stations that are outside of the band without having to tune the dial back and forth as you transmit and receive. I got out the old rack of six meter crystals and kept them handy so I could flip them in as desired. By having four or five crystals you can have one fixed spot in each one hundred kilocycles and you have no problems.

The Thor is also engineered for CW work. I haven't found much of this going on yet, but should it develop I'll be ready. I was sort of surprised not to find any CW during the Field Day contest for six meter CW contacts could easily have run up the score quite a bit for many stations. I called CQ many times on the low end, but never got an answer even though dozens of stations had worked all comers and were wasting their time calling CQ Field Day over and over on phone.

It is a pleasure to find a commercial transceiver that includes a bfo for CW reception. The bfo on the Thor is a combination spotting switch and bfo. There are three levels of injection so you can match the incoming signal for good copy. It even works on SSB, although you have to tune a little bit when you turn it back to an SSB station. I have worked most of the six meter SSB'ers now, so I can vouch that the Thor can do it.

One big problem on six meters is overload and cross-talk from nearby stations. Even the loudest of the competing stations in the VHF contest did not cause any cross-talk in the Thor. The nearby kilowatt did take out about 100 kc, but most fellows were complaining that he spread over 400 kc or worse, so the Thor did a fine job.

The Thor comes with an ac supply, or you can get it with a dc supply for a real potent mobile unit. It has push to talk operation or can be operated from the front panel. It has a noise limiter for hushing ignition noises. It has an effective S-meter that you don't have to apologize for every time you give a report.

As with all other Clegg gear, it is obvious when you use the Thor that they tried to give the most they possibly could, with price being secondary. Even so the price is amazingly reasonable: $349.95. . . . W2NSD/1

Transistor Mounting Techique

Many methods are used for mounting transistors and terminating the leads at the desired circuit points. These range from the use of conventional sockets or special mounting clips through the expedient of tacking in the full length leads and letting the transistor flop in the breeze.

A particularly simple and effective mounting method for round body transistors is shown in the photograph. This is a W4WKM variation of a method used in equipment manufactured by R.M.S. Associates of Mamaroneck, N. Y.[1] This method is equally suitable for use with printed circuit boards, terminal boards with eyelets or turret terminals and perforated board with push-in terminals.

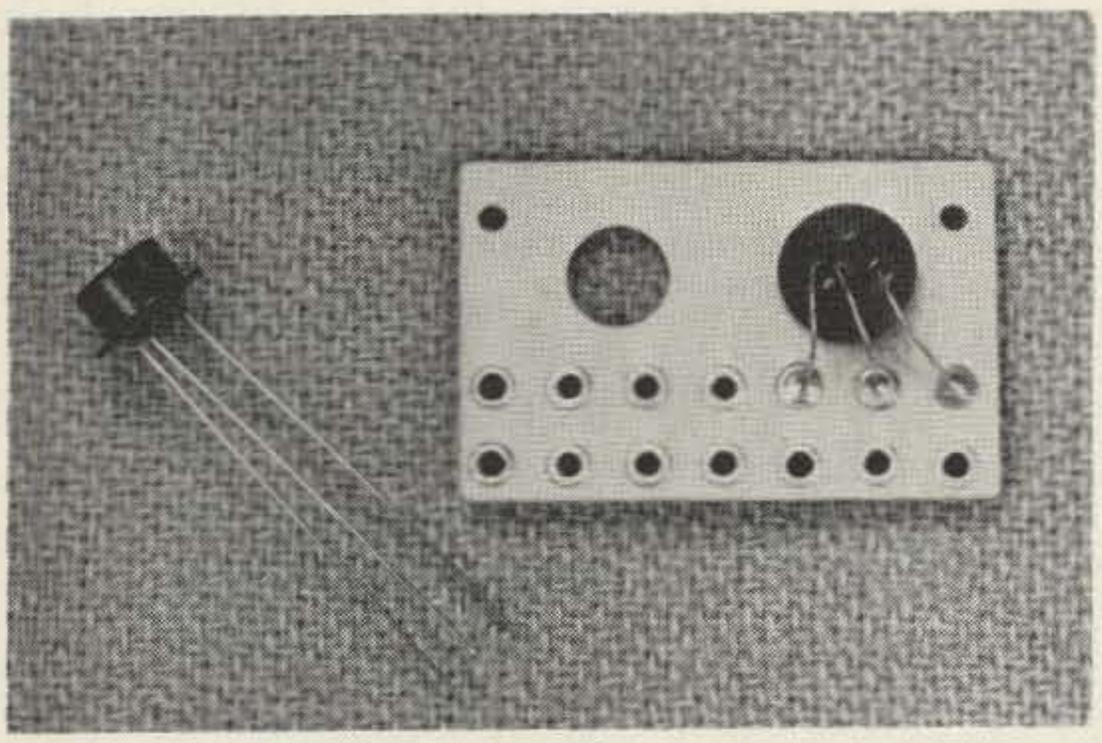

Photo by: Morgan S. Gassman, Jr.

The photograph shows the method. Simply drill a hole in the printed circuit or terminal board slightly smaller than the body of the transistor. Using a tapered reamer from both sides of the board, very carefully enlarge the hole so that the body of the transistor makes a snug force-fit in the hole. Dress the leads to the circuit termination points and solder in place.

The result is a neat, secure and space-saving mounting that is ideally suited to experimental and amateur construction projects. Try it on your next project.

. . . W4WKM

[1] "Press Fit Simplifies Transistor Mounting," Electrical Design News; May, 1962.

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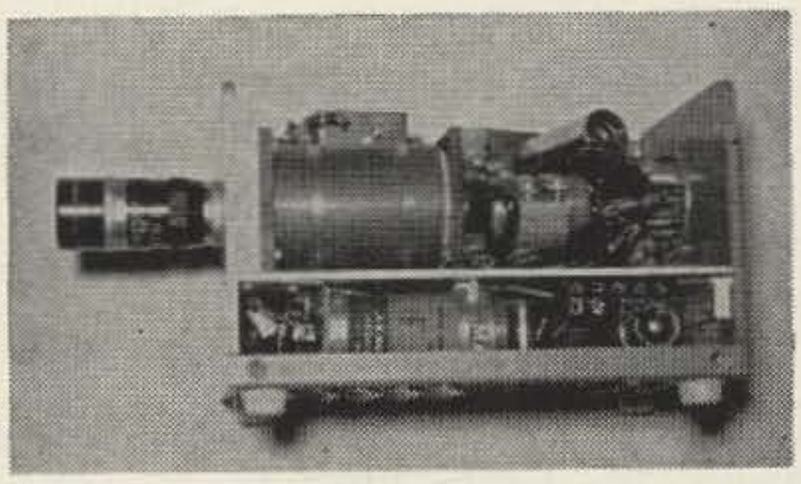

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Radio Astronomy

Part I

Radio astronomy was born in the year 1932, when Karl Jansky, a new member of the Bell Telephone Laboratories staff was sent to an experimental radio station at Holmdel, New Jersey. His job was to track down "atmospherics" which caused hums, whistles, and rumbles in radio receivers.

Jansky made a big antenna, 100 feet across, which he could rotate like a merry-go-round and so point in any direction he desired. Using this antenna he ascertained where each noise was coming from, identifying and studying the effects of thunderstorms on radio.

One thing had him puzzled, a weak hiss in his earphones, so weak that he could hardly hear it above the hum produced by his receiver itself. Jansky found that the noise appeared to rise with the sun in the morning and follow it. At first he thought it was caused by the sun itself, but as the months went by the source of this noise went more and more out of step with the sun, until he could hear it in the middle of the night. He studied his carefully kept records and found that the noise began four minutes earlier each day. He knew nothing about astronomy, so he referred to textbooks and decided that the signals were coming from the Dumbell Nebula in Cygnus.

The news of Jansky's discovery swept round the world. It made headlines in many of the newspapers, and the signals from the sky were relayed to New York and broadcast for everyone to hear. However, as suddenly as it had come, radio astronomy was forgotten.

Jansky pleaded with his employers to allow him to carry on his studies, but the needs of radio-telephone communication came first, and after a few years of experimenting in his spare time, Jansky gave up.

The radio engineers were not interested because they were too busy and knew nothing about astronomy; the astronomers, too, were busy and knew nothing about radio.

Only one man, Grote Reber, continued the study which Jansky had begun. Reber built a big thirty foot dish in his back yard. With it he studied the sky and confirmed what Jansky had discovered.

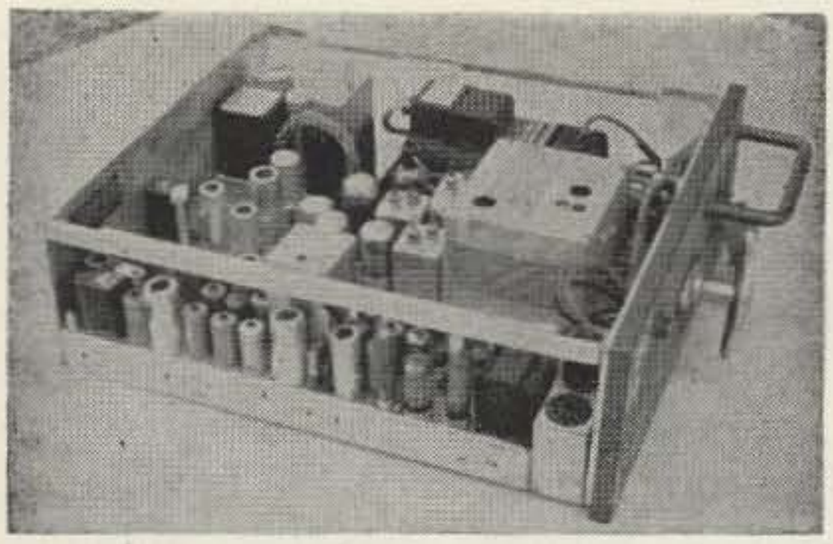
Part II

A radio telescope is really just a glorified radio receiver. However, the first thing which makes a radio telescope different is the size and shape of its antenna. It is true that you can pick up "radio signals from the sky" with almost any antenna, but most radio telescopes have more sophisticated antenna systems. The major reason is as follows:

If there are two radio stars close together a large radio telescope can separate one from the other, but a small antenna will simply record them as one large object. The ability to separate two stars close together is called *resolution*. (The human eye has an aperture of about ¼ inch, or about 6,000 wave lengths of light. A radio telescope "listening" at a wave length of one meter would need an antenna four miles wide to get the same resolution. To get the same resolution as the 200-inch telescope of Mount Palomar, the radio telescope's dish would have to be about the size of the Earth.)

Many radio telescopes use a big parabolic dish which collects the signals and focuses them on an antenna at the focus of the dish. All signals coming from the direction in which the dish is facing reflect properly on its focus. Signals from different directions are also reflected but miss the focus and are not picked up by the antenna. Thus the radio telescope can pick out one part of the sky.

The largest steerable radio telescope is the



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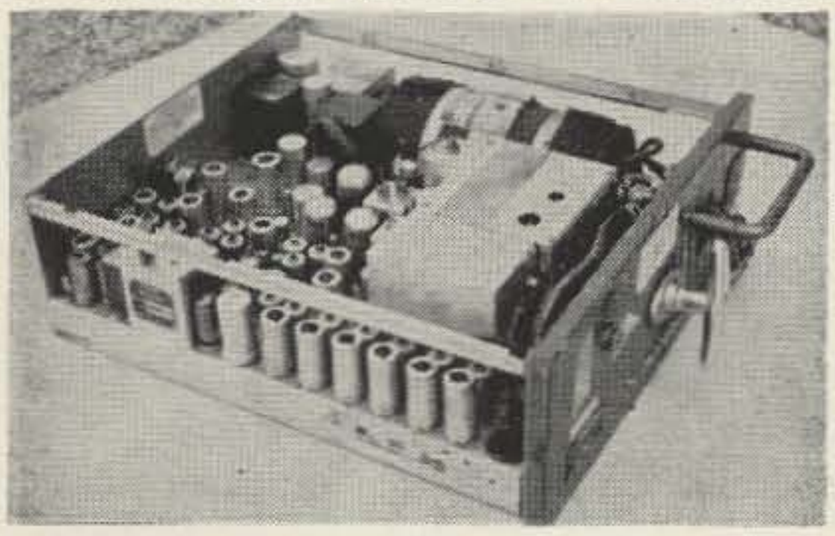

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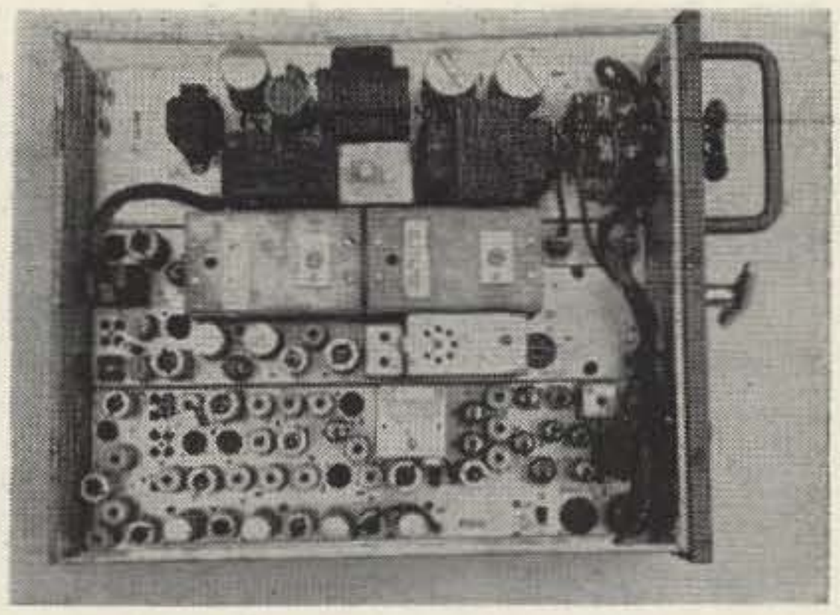

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250 foot Jodrell Bank telescope. To give its full title, it is the Steerable Paraboloid Altazimith Radio Reflector. What the British astronomers wanted when they designed the Jodrell Bank dish was a large reflecting dish which could be pointed anywhere in the sky, with a mast sticking out from the middle to carry the antennas at the focus of the dish. So that they could change antennas quickly, the whole dish must be turned upside down. The 800 ton Jodrell Bank telescope has to keep its parabolic shade accurately in whatever direction it is pointed.

The dish and its supports, weighing 1,800 tons together, turn bodily on a circular railway track. At full speed it can turn one complete revolution in 18 minutes, and the dish can transcribe a complete vertical turn in 15 minutes. It performs its scientific "twist" with the utmost gentleness and precision under the control of robots which can, for example, keep it trained on a star as it moves slowly across the sky.

Not all radio telescopes are steerable. Alongside the "Great Ear of Jodrell" there is a 220 foot dish made up of wires, lying on its back facing the sky with an antenna mast sticking up in the center. This telescope can watch only that part of the sky which moves directly over the dish.

The "Great Ear of Jodrell" is not the biggest radio telescope in the world, though it is at the moment the biggest steerable one. There are far bigger telescopes which work in a different way. These are called radio *interferometers*. The biggest, at Cambridge, are used to chart the most distant radio stars.

A radio interferometer consists of a number of antennas spaced widely apart. The easiest way to understand how a radio interferometer works is to think of the antennas as bits of one large antenna. Such a huge, imaginary antenna would make a very good and accurate radio telescope, but you can pinpoint radio stars as accurately with only bits, working together.

The radio interferometer is extremely directive. To be in phase with both antennas of the telescope, the star must be at an exact central position above and between the antennas. If it is not, it is out of phase with respect to one of the antennas and is phased out.

You have to pay a price for the advantage of saving so much antenna construction. The "picture" of the radio sky which you get using a radio interferometer is not a straightforward one. Using only parts of an antenna, instead of a picture you get a complicated pattern from which the radio astronomer has to calculate the actual position of radio stars. Also, the strength of the signals collected by these parts of an antenna is less than what it should be if the whole antenna were there.

The new Mullard Radio Observatory at Lord's Bridge near Cambridge has two great interferometers: one for studying the Milky Way; the other for picking out radio stars. Each is a long trough-like antenna (in one case 3200 feet long; the other 1450 feet long), together with a smaller movable antenna. Each collects radio waves over an area of 4½ acres, and they are the biggest radio telescopes of all.

After the antenna, signals are fed into either parametric amplifiers or masers and thence to a very sensitive receiver. A practical radio telescope would have to have a tuneable receiver. This is made necessary by the Doppler effect (as an emitting body moves away, its frequency is lowered; and as it comes closer, its frequency is raised).

The rectified signals are then translated into digital form and fed to computers for analysis and evaluation. This leaves the scientist time to devise more tricks for his mammoth toy to perform.

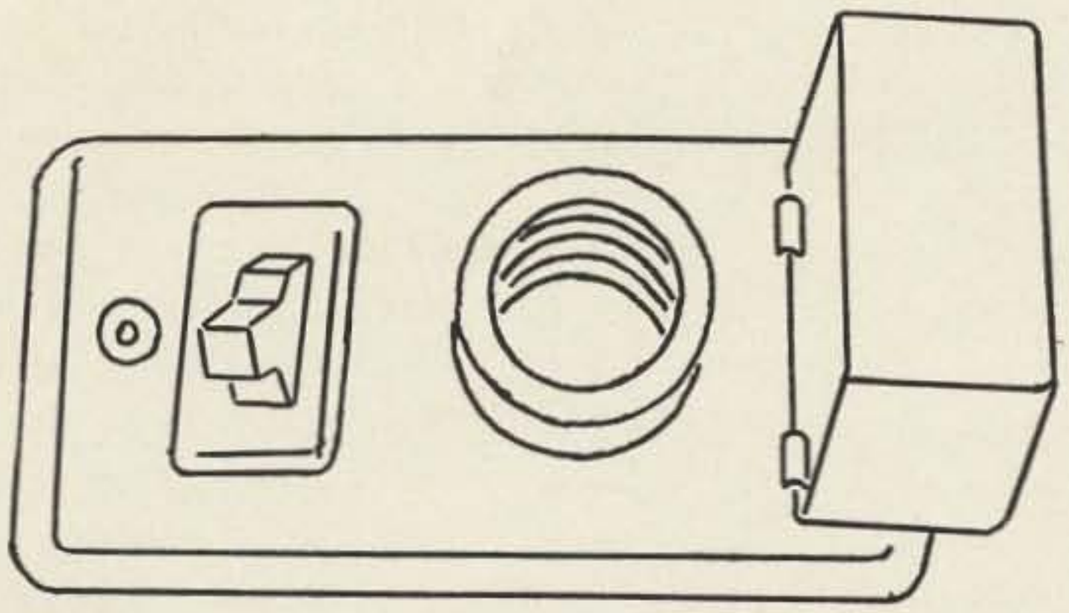
Bigger and better telescopes are planned for the future. Radio astronomy is still in its infancy, but much is hoped for in the future.

. . . WA2BWQ

The Big Switch

How many times have we ended a QSO with, "I've got to pull the big switch?" There is no telling how many switches actually have to be turned off. There is the switch on the transmitter, the switch on the receiver, the switch on the vfo, the switch on the monitor, the switch on the . . . well we could go on with quite a list of pieces of equipment that must be turned off before the station is closed down. The turning off of switches can be time consuming as well as risky. There is always the chance that a switch will be overlooked and left in the "on" position.

What is needed in most shacks is a readily accessible switch that will kill all the power at the operating position when the operator goes



QRT. Like most hams I run low power and so a 15 amp 125 volt circuit suits my needs as it may suit some other operators. As a main switch I use a device known to most electricians as a BUSS Fustat Box Cover Unit.

This switch, made by the Bussmann Mfg. Div., is small, inexpensive and available from most electrical wholesalers and some electronic distributors. Although it was designed to protect small motors from burnout, it suits our purpose as a fusible 15 amp main switch. It is easily adapted to most desk and console set-ups as a flush mounted device and it gives localized branch circuit protection. At my station I mounted the unit at the front of my desk and from there I ran the conductors to several convenience outlets mounted on the rear of the desk. The clock mounted beside the box cover unit is wired in ahead of it. All of the station equipment is plugged into the outlets on the back of the desk creating a neat and orderly arrangement. The box cover unit is fed by conductors from the nearest convenience outlet in the wall. Although the socket in the box cover unit has Edison Base threads for the common plug fuse, an adapter and the non-tamperable type "S" Fustat should be used. The box cover unit I used was the BUSS type SSU which fits the 2¼ inch handy box. They also make a type SSW which fits the 2¾ inch switch box. Both of these units list for $1.20 each. The 15 amp Fustat, S15, lists for $.21 and the adapter, SA15, lists for $.13 so the whole ball of wax is quite inexpensive. Bussmann also makes a 250 volt double pole switch and two fuse holder unit type STY that mounts on a 4 inch square box for the high power boys who use 220 volts.

This flush mounted switch makes a very neat installation and eliminates some of the rat's nest of extension cords and plugs usually found on most operating desks and tables. Most important, it does this economically and the net result is an attractive toggle type disconnect that turns on all of the station's components at the flick of a single switch.

. . . W4STX

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Double Power for cw

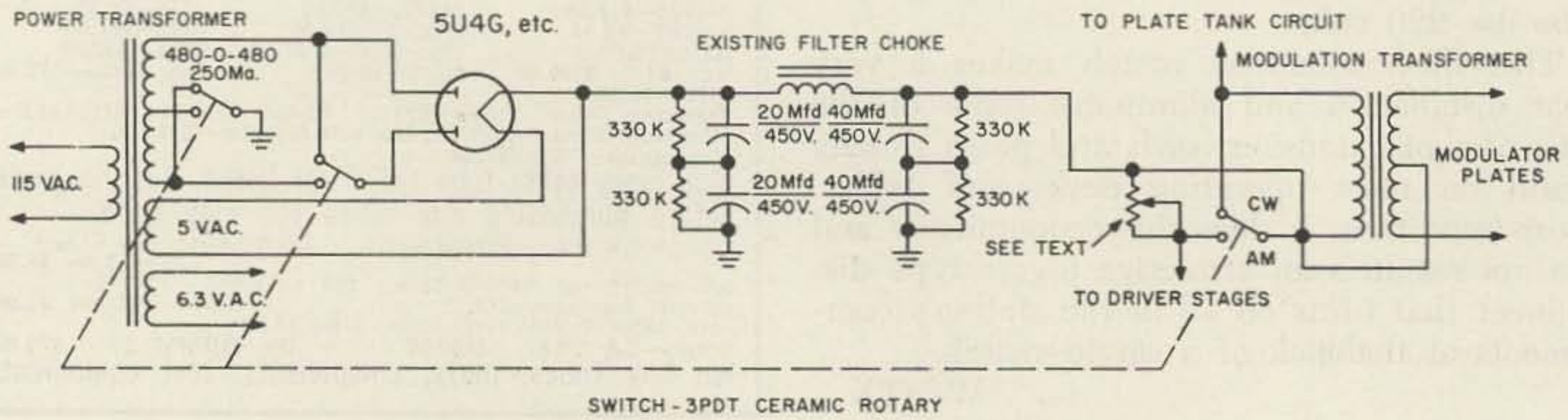
Hank Meyer W2EZJ, K3URS

Recently I designed a small transmitter for a friend using parts from the junk-box. Available were an 807W, 616s, a 20 watt modulation transformer, and components for a 400 volt, 250ma. power supply. I was all set to design the run-of-the-mill 40 watt phone-cw transmitter when it suddenly dawned on me that there was a complete waste of the 807W's cw capabilities. Since the transmitter was for 40 and 20 meters, it was desirable to get the most power out of the available components as possible. The limitations of the modulation transformer dictated that only 40 watts AM could be realized, but I hit upon an idea which would make it possible to run 75-80 watts on cw. The basic circuits are far from revolutionary, but I have never seen a system of this type used. The method of conversion consists of the addition of only a ceramic rotary switch, two extra capacitors, and a few resistors. The circuit can easily be extended to higher power transmitters as well as to such commercial units as the Lettine, Globe Scout, and others too numerous to mention.

Two sections of a triple-pole double-throw switch are used for the voltage conversion. For AM operation the transformer feeds the 5U4G as a full-wave rectifier delivering 400 volts to the 807W and 6L6 plates. For cw operation the 5U4G plates are shorted, one end of the transformer secondary is grounded, and the 5U4G is fed as a half-wave rectifier delivering 800 volts to the 807W plate. The third section of the switch shorts the secondary of the modulation transformer and places a resistor in the circuit to lower the voltage to the driver stages when cw operation is desired. The value of the dropping resistor (R5) will be determined by the current used by the driver stages and the voltage drop required to bring the voltage to the normal operating value. This resistor is external to the normal dropping resistors used in the driver stages. The additional capacitors are added in series with the existing filter capacitors to allow for the raised voltage. Of course, if the existing filter capacitors are of low capicity, they, too, will have to be replaced to give adequate filtering of the half-wave output. The 330,000 ohm resistors are placed in the filter section to assure that the voltage developed across the capacitors is the same for each so that their 450 volt rating will not be exceeded.

No difficulties should be encountered in the operation of the transmitter if a few precautions are taken. The plate by-pass capacitor should be of high enough voltage rating to allow for the increase. The plate tank capacitor should not have to be replaced since it is designed for peak voltages, developed under AM operation, which won't be exceeded under the new cw conditions. Most important of all is that the AC POWER SHOULD BE TURNED OFF BEFORE SWITCHING MODES OF OPERATION.

. . .W2EZJ



Attention Club Secretaries

Many of us, in our affiliations with radio clubs, nets, or MARS find it necessary at times to address mail to certain addresses fairly regularly. A great deal of time that could otherwise be used for operating on the air or for experimenting at the bench is taken by the chore of addressing this mail.

Unless you are an ardent secretary (or have one at your command) you would probably be glad to turn your address-o-graph duties to someone else. But alas! There is an easy way to do the job. This method works on the principle of the "Ditto" machine, or hecto-graph, but on a smaller scale.

Obtain one or two carbon-backed master sheets (such as Curtis-Young "Sealfast" Master Unit #H 109, Panama Beaver "6X Uni-master", or equivalent). Type your mailing addresses directly on the glossy side of the master sheet. This will cause the special carbon from the backing sheet to stick to the back of the master. (Be sure to remove the protective tissue from between the carbon sheet and the glossy sheet.) An address form of three to four lines can be trimmed to a stencil size of about four inches wide and an inch to an inch and one-half long—so that one stencil sheet will make at least 15 or 20 address stencils. These stencils can all be stored together in an envelope when not in use.

To address the mail, take a ball of absorbent cotton about the size of your thumb, wet it with ordinary rubbing alcohol and wipe over the area where address is to be. Before alcohol dries, place stencil—carbon toward wetted paper—against the envelope and rub thumb across back of stencil, pressing it against the envelope. Lift off the stencil and your mail is addressed. The entire operation of addressing takes no more than ten or fifteen seconds once the stencils are prepared. Each stencil is good for at least 25 or 30 uses. This system is a lot less messy than trying to use mimeo ink and stencils by hand, as some do. The master stencils may be obtained for about 10¢ each at most stationery stores and a good sized bottle of rubbing alcohol may be had for 35¢.

See you on the air in your spare time!

. . . W2BVE

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Panadaptor Converter

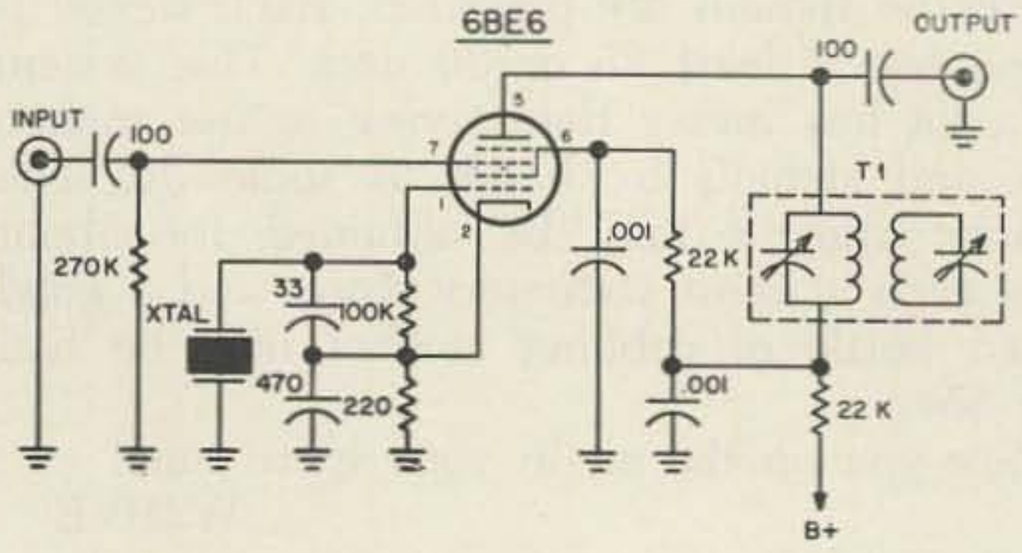
Larry Kiner K6VNT
17805 Lorne St.
Reseda, Calif.

Have you hesitated buying a panadaptor because your receiver *if* frequency and the panadaptor input frequency are different? Many amateurs have assumed that both frequencies must match or the units will not be compatible.

Here is a circuit that will eliminate your concern in purchasing one of these most sought after devices and give you untold pleasure in watching band activity.

The total purchase price for the converter components should not exceed $10.00. The unit may be built onto either the receiver chassis or the panadaptor chassis, whichever offers the most room. The builder may, of course, build the converter into a small outboard chassis if desired. If installation is to be made on either the receiver or panadaptor, it might be wise to build the circuitry onto one of the popular vector sockets to reduce the total area required for the converter.

Two of the components required in the converter will be determined by the receiver *if* and the panadaptor input frequency. These two are the crystal and the output transformer. To determine the crystal frequency we add the receiver *if* frequency and the panadaptor input frequency together. The author has a NC-300 currently used in conjunction with a surplus Navy Type RCX panadaptor. The first *if* of the NV-300, 2215 k, is used. The input frequency of the RCX is 455 kc. Adding these two together gives us 2670 kc, which is the crystal frequency. This same procedure would be used



for other *if* frequencies.

The transformer is determined by the panadaptor input frequency. Select an inexpensive *if* transformer that will match the panadaptor input frequency. Only the primary is used. After the circuit is completed it may be necessary to peak the primary for maximum gain. This is the only adjustment required in the converter.

Connection to the receiver is made according to the instructions of your panadaptor manual. If you have a surplus panadaptor without a manual, you may want to try this method which has proved most successful at the QTH of K6VNT.

Remove the tube shield over the receiver mixer tube. Wind 10 to 15 turns—the number of turns is not critical—of tinned wire around the tube itself. At the top end of the coil solder the inner conductor of a length of shielded wire (do not use coax as it is too bulky). Now wrap some black electrical insulating tape around the coil and the solder connection. The purpose of this is to preclude the possibility of shorting the coil and solder connection to the grounded tube shield. Replace the tube shield by slipping the shielded cable through the shield. Finally install a connector —coax or phono—at the free end of the shielded cable and plug this into the input plug of the panadaptor converter. The gain obtained from this method should be more than adequate and it introduces absolutely no degradation of receiver performance.

Converter construction is straight forward and not at all critical. The only precaution that should be observed would be in the use of shielded cable for both input and output connections.

(Turn to page 100)

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(Panadaptors from page 99)

This circuit is most useful to receivers employing dual or triple conversion and it is recommended that the first *if* frequency be chosen to work with as this will give you the most bandwidth for your panadaptor. The converter has been built locally for receivers having 1650 kc and 2215 kc *if's* and panadaptors with input frequencies of 400, 455 and 500 kc, with everyone a success.

B+ requirements for the panadaptor converter may be drawn from either the panadaptor or receiver and should be approximately 200 volts. The 6BE6 will draw about 10 ma B+ and 300 ma filament, which are readily available from either source.

Best of luck and good viewing on your panadaptor.

. . . K6VNT

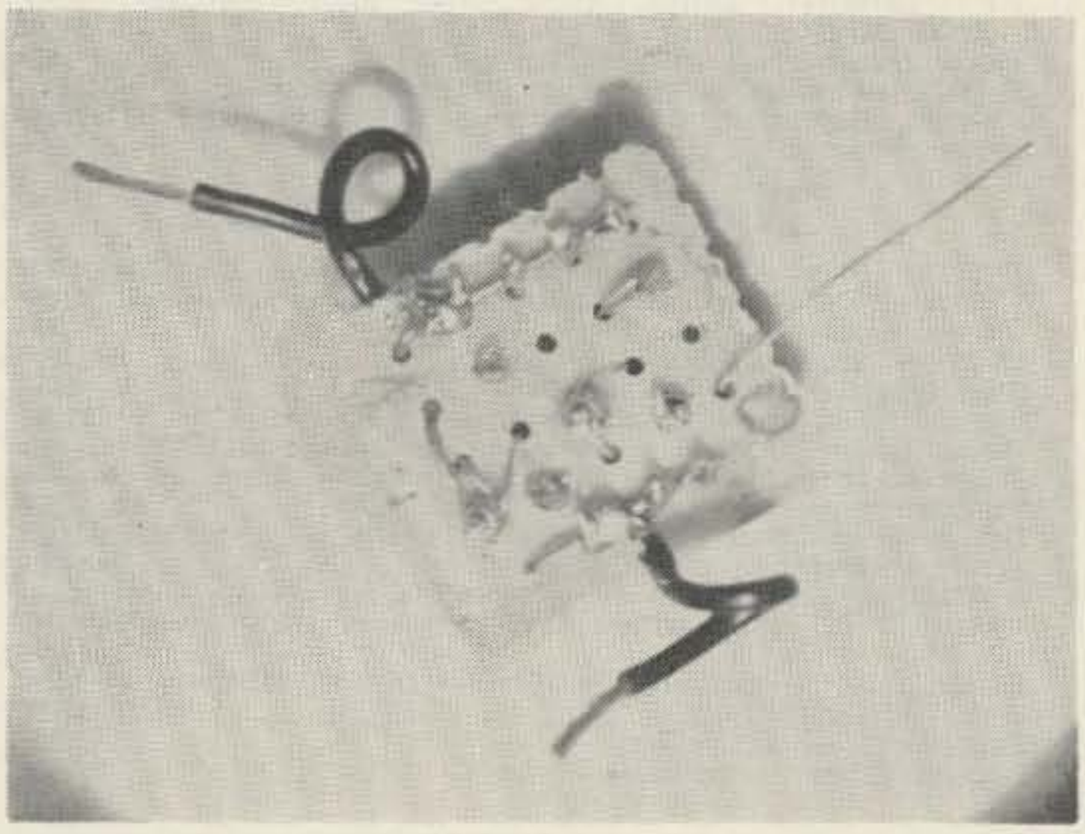
Compact Transistor Circuits

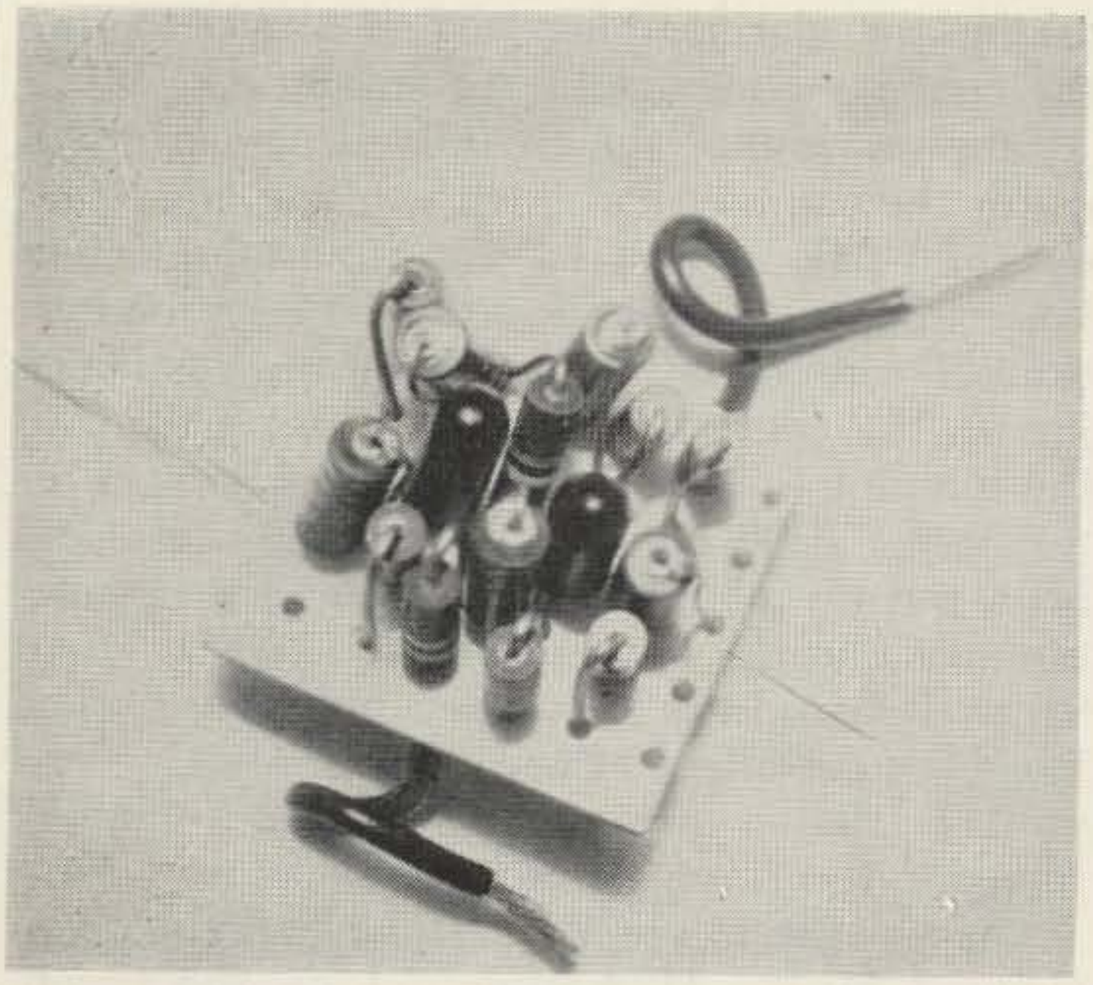
Steven Pullman
10 E. 198th St.
New York 68, New York

I recently became the possessor of a high impedance, low output, dynamic microphone. The output of the microphone is 70db below 1 volt/microbar. Because of this low output, an amplifier was needed to provide a usable voltage level. My main consideration was space.

Printed circuit construction appeared to be the best method, but in order to reap all the benefits of printed circuits, resistors and capacitors must have leads from one end only. Not having the materials to make a printed circuit nor the special lead configurations, I had to find another method of a compact circuit arrangement. What I came up with is a printed circuit technique without the printed circuit or the special components.

I used an unclad, 1¼" x 1" perforated board with closely spaced holes. The circuit is a two transistor preamplifier. The components are standard except for the electrolytics, which are inexpensive miniatures with standard axial



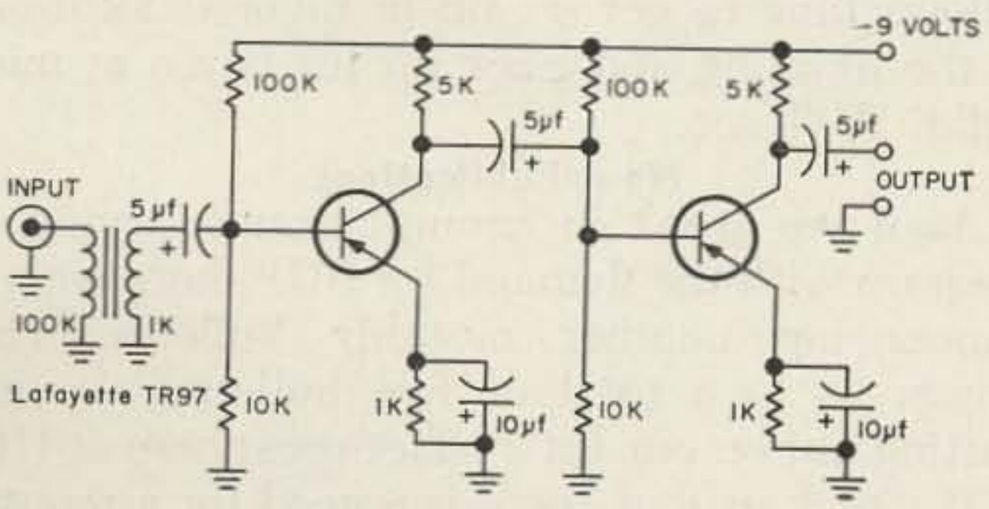


leads. The circuit is laid out on the board exactly the way the schematic is laid out. Components should be bent carefully, and only once, or else extra components will be needed. Check the polarity of the electrolytics before soldering them in the circuit. I learned this the hard way! Use heat sinks on the transistors and use a low wattage soldering iron.

The finished product contains eight (½ watt) resistors, four miniature electrolytics and two non-miniature transistors. Since the pictures were taken, two more standard size capacitors were added to the board. The transformer is a miniature type, a Lafayette TR97, which is not mounted on the board, but in the microphone case.

No feedback problems were encountered because the circuit is laid out in a straight line. This psuedo-printed circuit construction can probably be used up thru the broadcast band. By the way, the amplifier has a voltage gain of 520 with an input voltage of 5 millivolts. The frequency response is very wide, too wide for speech work. It can be restricted to speech frequencies by placing a 0.0033 mfd capacitor in series with the input and a 0.01 mfd capacitor shunted across the output to ground. This will limit the response to approximately 300 cps to 3500 cps.

. . . Pullman



Transistors: 2N280 or 2N190

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2214.563	2223.250	2243.500	2250.000	2265.250	2293.750	2681.000
2695.000	2715.000	2782.000	2855.000	2877.000	2887.000	2894.000
2990.000	2998.000	3000.000	3005.000	3020.000	3035.000	3052.500
3057.500	3143.5000	3154.500	3156.500	3158.500	3161.500	3166.000
3173.000	3181.250	3181.250	3203.500	3207.250	3217.500	3248.875
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1905	1910	1915	1920	1925	1930	1935	1940	1945	1950	1955
1960	1965	1970	1975	1980	1985	1990	2005	2010	2015	2020
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(NSD trivia from page 4)

hotels most places are remarkably reasonable and I'll bet that we would have little difficulty in holding ourselves to $5.00 per day for hotel and food, which would cost about $300 for a 60 day trip.

I had in mind an itinerary something like this: Idlewild, Bermuda, Azores, Lisbon, Madrid, Rome, Athens, Istambul, Beiruit, Jerusalem, Cairo, Baghdad, Teheran, Kabul, Karachi, Bombay, Colombo, Calcutta, Rangoon, Bangkok, Saigon, Hong Kong, Manila, Teipeh, Seoul, Tokyo, Wake Island, Hawaii, San Francisco, Idlewild. This could give us an average of about two days each in thirty countries.

We need a minimum of ten for the trip. If you are interested in such a tour please let me know. If we can get ten together for it we're in business. We will be taking along some transceivers and operating in as many countries as we can along the route. Since this will be an official club tour we might be able to get special permission in many interesting places. We can beat the rainy season in the far east if we start in mid-April and return in mid-June.

Another trip we are working on is less ambitious. This would run us through Scandinavia. Stops would be made for about four days in each city at: Copenhagen, Oslo, Stockholm, Helsinki and Berlin. Three week tour. We had in mind making this trip next fall in early October since the weather is at its finest during those days and hotel accommodations are not difficult for groups. The cost of this trip, including hotels and breakfasts, will probably be close to $550.

Wrappers

Each month my copy of CQ arrives all battered and torn. I think of this as I order more wrappers for mailing 73. Things must be getting really tight down at CQ if they have to omit the wrapper. I just took a look at the invoice to see what these pieces of kraft paper cost. Like to make a guess at how much I would save if we mailed 73 with just a sticker and no wrapper? Well, a full years supply, 12 wrappers costs just a hair over 2½c. Yes sir, I could save 2½c a year on each subscription if I didn't buy wrappers. When we get that hard up I suggest that you stop subscribing because we are about to fold up.

Another Contest

CQ magazine decided to run a silly VHF contest August 24-25th. I decided to make them sick by entering it. The rules were so unbelievably vague that I wrote them a letter asking for clarifications several weeks before the contest. That's right, no answer.

Since several of the six fellows up here with us for the summer had been working on setting up the VHF station on 73 Mountain, I had hopes that we might be in business by contest time. I tore myself away from the magazine just as the contest started and porsched up to the mountain. Yep, nothing was working. Fortunately the 96 element two meter beam had been put up a few days before and was functioning. The rig was full of parasitics so I had to get it tuned up. It worked pretty well once I had it neutralized. Two was completely dead until I tried a new converter. . . . I think someone fed some rf into the old one.

On six meters we were still using the three element Hi-Par Hilltopper out on the porch. Within a couple of minutes I had the Clegg Thor plugged in and working.

When I started the contest I had in mind working at it for a few hours and then quitting once I had New Hampshire sewed up. I reckoned without K1PDA up on Pack Monadnock. He operated only on six meters and was on there every minute for the 24 hours of the contest. He made over 250 contacts in (I believe) 36 counties. I worked 35 counties, but gave up at midnight after working only 74 stations. I wanted to stop at 73, but a chap in Maine came on and I couldn't stand it.

Shortly after getting going I discovered that the big beam on two meters gave me quite an advantage. I hit 88 contacts by midnight in 53 counties and decided that that was enough. I took it easy during the contest, making a few contacts on one band, talking to the many visitors, getting a snack, answering the phone, trying the other band for a while, and so forth.

It is probably my age creeping up on me, but I find that I have markedly less enthusiasm for all night contests now than I used to. Judging from the quiet that settled over the bands after midnight I was not alone. Only a small handful of youngsters sat it out. When we run a VHF contest I'll bet that it will not run for 24 hours. Maybe something running from noon until midnight, which would give fellows time to get set up in favored locations in the morning and pack up for home at midnight. We'll see.

New Publications

As if we aren't in enough trouble trying to keep up with the demand for 6UP, here we are announcing another monthly bulletin. This brings us to a total of five bulletins we are putting out on our little offset press here at HQ.

It struck us that there is a need for a monthly bulletin devoted to the world of ham con-

tests. Only a few of the big ones are reported in any depth in the regular ham publications. A bulletin devoted to detailed rules and results of contests should be of interest to the ham contester as well as a big help to the clubs who are sponsoring the contests.

This new bulletin will be called "5-7-9," the usual signal report sent during contests. This is consistent with our numerical type publication names too. The first issue is scheduled for October first. The yearly subscription to 5-7-9 is $2.

Clubs planning to run contests of interest to all amateurs are invited to send the date and time of your contest as soon as it is decided, the rules as soon as they are available, and then, after the contest has been run, a preliminary announcement of claimed high scores and a final report on results for publication in 5-7-9. Send your info to 5-7-9, Peterborough, N. H. Make $2 checks (or send cash) payable to 73.

We think this bulletin system of providing specialized information is a great system for it leaves the pages of 73 free to be used for information of interest to all readers and lets us give the specialized news in depth. We might just be interested in publishing bulletins on many more special facets of ham radio if we could find some good editors who would take on the responsibility of getting the bulletin in our hands ready for printing each month in exchange for a percentage of the subscription fee. Many more fields could be covered, such as traffic handling, certificates, DXing, mobile operation, RTTY, etc.

Mensa

Life magazine surprised me recently (August 16th issue) with a Special Report on Mensa. This is a club made up of people with above average I.Q. Virginia and I joined back in mid-1960 when it first came to the U.S. from England. We were both tickled to find ourselves mentioned in the article, though obliquely, as two of the original six who founded Mensa in the U.S. and got married and haven't been seen since. Actually we got married and disappeared into the pages of 73 and thence to New Hampshire. We're still Mensa members. We were a little sorry to see them drop the entrance qualifications from the top 1% of the population to the top

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2%, but then I guess we like to have things big here in the U.S. and there are now 900 members in this country, with 3500 worldwide.

ADS

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May I remind readers that it is the advertisers who make this magazine possible. Without them there would be no magazine. Remember this as you read through 73. Remember this when you talk to prospective advertisers.

73 News

In addition to the latest news in ham radio, Marvin VE3DQX, in his monthly 73 News Bulletin, covers those items which have appeared in newspapers during the month. We would appreciate your help in this. Please, if you see any mention of ham radio in a newspaper, tear it out and send it to Marvin Lipton, 311 Rosemary, Toronto 10, Ontario, Canada.

If you are interested in the latest happenings in ham radio, if you are an officer of a club, or the editor of a ham club bulletin you will be sorely distressed if you are not subscribing to 73 News. $1 per year.

W1FZJ

Further back than I like to remember I used to spend a great deal of my operating time down on the low end of the 75 meter band. One of the inhabitants of that area was W8UKS, Sam Harris, out in Burton, Ohio. We talked a lot and became pretty good friends. We both enjoyed DX'ing down there too. But Sam was much better known for his VHF work. I believe he was the first W8 to poke a signal into the east coast and he was the one you listened for when there was a chance of the band being open or a slight whisper of aurora.

In 1951, when I moved out to Cleveland as a television director, I naturally brought along a rig. This closer touch with Sam resulted in me driving over to see him one day. Good Lord, a beard! But even more impressive was his station, which consisted mostly of a huge old self-supporting broadcast tower up on the top of a hill. Next to it was the beginnings of a house, consisting mostly of basement and some building materials. Sam, together with his wife Helen and his two children, Pat and Midge, were living there until he finished the rest of the house.

As the RTTY bug bit deeper into me I gradually dropped out of my old 75 meter haunts and spent most of my hamming time hunting and pecking at the TT machine and building converters. I did write a couple short pieces for Swap and Shop, which Sam edited. Then Sam moved east, up near Boston, and I didn't hear anything from him for quite a while.

In January 1955, when I took over editorship of CQ, one of my first editorials decried the lack of a VHF column in CQ and I asked for someone to volunteer to run one. Quite a few fellows spoke up and I was having a difficult time deciding until a note from Sam arrived and that was that. I felt that his experience in VHF's, his almost encyclopedic understanding of the technical aspects and his quiet wit would be a winner. I was right.

In 1960, when I left CQ, Sam also left, and for one of the same basic reasons: why continue to put in all that work when you have no idea of when you are going to get paid? I believe they were about a year and a half behind on paying Sam and I think they still owe him an enormous sum. I know they do me.

Sam's popularity, though it had apparently escaped the notice of CQ's publisher on paydays had not escaped Budlong, the then virtual dictatior of the ARRL. Sam was made VHF editor of QST.

Perhaps you remember that Sam built the first working parametric amplifier (on six meters) and is today recognized as the leading expert in the field. Until he went with Tapetone (Telco) a bit over a year ago, he had been chief engineer at Microwave Associates. His

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PL-259, SO239, M-359-UG-100A/U New Any 3	$1.00
T-18-ARC-5 Transmitter 2.1 to 3mc New	$9.95

RECEIVERS

SP-600 JX—540kc-54mc/s	$450.00
R-388 (51J3, 500-30.5mc/s	$575.00
R-390 Digital Job 500-32mc/s	$990.00
URR-13 225 to 400mc/s	$420.00
AR-8506B RCA Marine Rcvr.	$240.00
AR-88 500kc to 32mc/s	$170.00
CR-10 RCA Fixed Freq.	$75.00
Wilcox F-3 Fixed Freq.	$65.00

Boonton 212A Glide Scope Tester L/N $375.00

NEW SURPLUS TUBES GUARANTEED

2C39A	$7.50	250TH	$18.50	GL6442	$20.00
3CX100A5	$10.00	4X250F	$25.00	5894	$17.50
6161	$35.00	807	$1.00	416B	$12.95
4-65A	$7.50	6360	$3.50	7212	$4.95
8005	$14.00	7580	$34.80	4X150A	$9.95
807W/5933	$2.00	6AN5	$1.25	4X250B	$20.00
5881	$1.50	723A/B	$3.00	4X150G	$25.00
4-125A	$20.00	2E22	$2.90		
2K25	$5.00	4X150D	$9.50		

We buy & sell large quantities of Military and Commercial Test Equipment. AN/GRC, PRC, TRC and test equipment TS and AN/UPM or URM. What have you for sale or trade?

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intense interest in ham radio had a lot to do with his change to Tapetone, where he hoped to produce a long line of ham VHF gear. Unfortunately merchandising didn't keep up with engineering and Telco had to drop out of the ham market to make ends meet.

This seemed like a shame to me and I could see ham radio as the loser. I grumbled so much about this that Val K1APA, our number one hand, got to working on the problem and came up with some financing and an agreement with Sam to get back into the ham business again. I'm happy to see Val go out on his own like this and I'm sure that Sam is happier than he's been in ages. I'll probably get my licks in a bit with their advertising, as I do with Waters, Meshna, and a few others with more courage than sense.

Val and Sam are rushing a bunch of products to be sold as Red Line. Why? "Well, red is a nice color."

Big Blow

The Windblowers VHF Society have a certificate for you if you can work W2NUL in Pennsylvania, K2KSH in New York, W2NLN in Connecticut and W2ZRD in New Jersey on two meters on September 28th from 1400 to 2400 local time.

I.L.

Though the furor over incentive licensing and restricted voice bands is dying down, I see that QST still manages to round up a few letters in favor of their stand each month. I don't know where they get them. We're preparing a bulletin of reprints of the best letters we've received on the subject, both pro and con, which will go out to all IoAR Bulletin subscribers ($1 year). The Bulletin is unbiased and lets the letters speak for themselves.

The September QST editorial invokes the spectre of the next Geneva Conference (and well they might, for it is a foreboding spectre) with the implied threat that unless we shape up we are likely to lose frequencies.

I agree that we are quite likely to lose a lot of our best frequencies, but I don't think that the technical level of our amateurs is going to have a lot of effect on the outcome. I do think that this might be a very poor time to make any moves which could possibly lower the number of stations active on our ham bands.

It seems to me that this whole negative approach is a poor one. I've got some ideas that might be helpful, but I've ranted on much too long this month and will save them for a later issue.

73 parts kits

In the interests of making home construction simpler for those readers with anemic junk boxes 73 has gathered together the parts required for building our less complicated projects. These kits are as complete as we can make them, containing good quality parts. Except where the chassis or case is integral to a unit we do not supply it. We will mention when we do supply a case or chassis. We do supply tubes, sockets, condensers, resistors, transformers, connectors, etc. The kits are kept in stock to the best of our ability, though sometimes the distributors who supply us delay us a bit.

TWO METER PREAMPLIFIER. Uses two 6CW4 nuvistors in a grounded grid input circuit (March '63 p8) and one 6CW4 nuvistor grounded grid output. Complete with power supply. Uses 50 volts on the plates for extraordinary noise figure. Full scale drilling template supplied.
W9DUT-1 ..... $18.50

QRP TRANSMITTER. Have fun with this little one half watt CW rig on 40 meters. Uses any 40M surplus crystal. Kit supplies 1S4 tube and socket, condensers, resistors, coil, rf choke, terminal trip, etc. Runs from flashlight battery for filament and portable radio 67½ volt B-battery. See March '63 p22
W1MEL $6.00

15-20 METER NUVISTOR PREAMPLIFIER. Need more hop on these bands? This simple to build preamp will bring up those signals. This is particularly good for inexpensive and surplus receivers. See April '63 page 40
W6SFM-1 ..... $4.00

TRANSISTOR POWER SUPPLY. Voltage regulater adjustable power supply for running transistor equipment. Takes the strain off those transistor batteries. Great for the test bench. See April '63 page 8. Uses five ransistors, one zener, cute little (expensive) meter, etc. Will deliver up to 100 ma continuously, voltage from 0.35 to 15.0.
W1ISI $25.00

TRANSISTOR TRANSCEIVER. One of the most popular kits we've ever assembled is this six meter miniscule transistorized transceiver. Really works. Hundreds built. See page 8 in the May '63 issue. Five transistors.
K3NHI $25.00

CW MONITOR. Connects right across your key and gives you a tone for monitoring your bug. Page 44, June '63.
WA2WFW $4.25

TWOER MODIFICATION. Increase your selectivity considerably by installing a new triode 7587 nuvistor stage. This is our best selling kit to date. Everything you need for the modification is included. See June '63 page 56
K6JCN $6.50

SIX METER CONVERTER, DELUXE. 6EW6 low noise front end, 6U8 oscillator and mixer. Output is 10.7 mc (easy to change to suit your needs). This is a tunable converter with fixed frequency output, not the usual converter that requires you to tune the receiver. This helps considerably on eliminating interference from nearby high power stations. See page 8, July '63.
W9DUT-2 ..... $20.00

TUNING EYE KIT. This kit enables you to install a dual tuning eye in any transmitter to indicate the tuning of two or more stages. It works far better than a meter or even meter switching. See page 22, July '63.
K6GKU $7.50

NOISE GENERATOR. Invaluable test instrument for tuning up rf stages, converters, etc., voltage regulated by a ener diode. Kit includes even the battery and mini-box.
K9ONT $5.00

CAST IRON BALUN. Eentsy balun using ferite core, covers 6-40 meters, will handle up to 20 watts, complete with cabinet, connectors, etc. See September 1963 page 8.
W4WKM-1 ..... $3.00

BOURBON S-METER. Much better than the usual Scotch S-meter. Here is an S-meter kit for those of you with receivers without S-meters. Includes tube, adjusting pot., socket, resistors, and meter. See September 1963 page 18.
W6TKA-2 ..... $6.50

NEW PARTS KITS

Bowing to reader demands for us to enkitify some of our past construction articles, we hereby present three new parts kits.

TONE MODULATED CRYSTAL STANDARD. Uses one tube and one mc crystal to generate 1 mc markers all the way up through 225 mc. The built in tone generator makes it possible to easily identify the markers. Including Minibox, tube, crystal, etc.
W9DUT-3 ..... $15.00

TRANSISTORIZED MODULATOR. 40 watt modulator, excellent for plate modulating mobile rigs, four transistors, uses 12 volts dc, only draws 250 ma while resting with peaks of 4-5 amperes. Kit includes transistors, transformers, resistors, condensers, etc.
VE7QL $27.50

SHORT WAVE CONVERTER FOR HAMBAND RECEIVERS. One tube short wave converter so you can tune SW broadcast stations. Power supply included.
W2LLZ $13.00

WRETCHED K2PMM

BADGES $1.00 each.

One of the big problems at hamfests and club meetings is to have everyone plainly enough marked with their first name and call. All sorts of stickers and pieces of cardboard have been tried, plus little cards which can be typed up and stuck in holders . . . all have the same problem: they are hard to read from any distance.

The best answers to date are these engraved laminated plastic name badges which can be read by Cousin Weakeyes from seventeen paces. You are in luck. We've arranged to make these darbs available at a real low price, all personally engraved. The badges are 3" x ¾" and come complete with a pin and safety lock. Please give your first name, call and specify whether you want the badge to be bright red with white letters or jet black with white letters.

Order from

73 Peterborough, N. H.

OTHER 73 BULLETINS AND BOOKS

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ATV Bulletin. Semi-monthly bulletin for the ham TV enthusiasts. Technical and operating news. $1.00 per year.

5/7/9. Monthly bulletin for those interested in contests. Lists all contests being held, gives rules and results on contests not covered in QST or CQ. $2.00 per year.

73 News. Published monthly, editor VE3DQX. Keeps you up-to-date on current ham events. In valuable to club officials for discussions at club meetings. Good source material for club bulletins. 1.00/year.

Ham-RTTY. This is the most complet book on the subject. Written for the beginning TT'er as well as the expert. More complete and authoriative than books at twice the price. Pictures and descriptions of all popular machines, where to get them, how much, etc. $2.00

Bound Volume 1. Gorgeously bound library volume (bright red) of the first fifteen issues of 73. This is the only way to get a complete set of the early issues of 73. We'll pay $1 each for copies of the January 1961 issue in good condition so we can make a few more bound volumes. Covers October 1960 through December 1961. $15.00

Bound Volume 2. Complete matching volume covering 1962 issues of 73. $15.00

Binders. Bright red leather binding. Specify which year you want stamped on them: 60-1, 62, 63. Darbs. $3.00 each.

Back Issues. Since each issue of 73 features articles of a fairly timeless nature each back issue is just as much fun reading as the current issues. All back issues except January 1961 (we'll pay a dollar for these if you can find any) are on hand, some in mighty small quantities. 1960 issues $1.00 each. February 1961-date 50¢ each.

Care and Feeding of Ham Clubs—K9AMD. Carole did a thorough research job on over a hundred ham clubs to find out what aspects went to make them successful and what seemed to lead to their demise. This book tells all and will be invaluable to all club officers or anyone interested in forming a successful ham club. Hundreds of grateful letters have been received from clubs who have applied the ideas in this book. $1.00

Simplified Math for the Hamshack—K8LFI. This is the simplest and easiest to fathem explanation of Ohm's Law, squares, roots, powers, frequency/meters, logs, slide rules, etc. If our schools ever got wind of this amazing method of understanding basic math our kids would have a lot less trouble. 50¢

Index to Surplus—W4WKM. This is a complete list of every article ever published on the conversion of surplus equipment. Gives a brief rundown on the article and source. $1.50

Ham-TV—WØKYQ. Covers the basics of ham-TV, complete with how to get on the air for under $50. Not the usual theory manual, but a how-to-do-it book. $3.00

Surplus TV Schematics. You can save a lot of building time in TV if you take advantage of the real bargains available in surplus. This book gives the circuit diagrams and info on the popularly available surplus TV gear. $1.00

AN/ARC-2 Conversion. This transceiver sells in the surplus market for from $40 to $50 and is easily converted into a fine little ham transceiver. Covers 29 mc (160-80-75-40 meters). This booklet gives you the complete schematic and detailed conversion instructions. $1.00

AN/VRC-2 Conversion. Completely different from the ARC-2. This book gives you complete instructions on converting the inexpensive VRC surplus gear into a six meter wide band FM transceiver. There are probably over a thousand stations now operating on 52.525 mc around the country. Join the crowd. Fun. $1.00

Coils—K8BYN. Basic book which covers the theory and practical aspects of the many different types of coils found in ham work. Well illustrated. 50¢

CW—W6SFM. Anyone can learn the code. This book, by an expert, lays in a good foundation for later high speed CW ability. 50¢

3D Map of World. Maybe you've been eating your heart out for one of these beautiful relief maps after seeing one at a friend's shack. Comes complete with one year subscription or extension to 73. $9.95

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Mickey Miker—WØOPA. Complete instructions for building a simple precision capacity tester. Illustrated. 50¢

Frequency Measuring—WØHKF. Ever want to set yourself up to measure frequency right down to the gnat's eyebrow? An expert lets you in on all of the secrets. Join Bob high up on the list of Frequency Measuring Test winners. $1.00

Impedance Bridge. Full scale construction prints for the bridge described in the August 1961 issue of 73. Comes complete with a reprint of the article. Watch out General Radio! $1.00

SSB Transceiver Schematic—W6BUV. Giant size schematic of the transceiver that appeared in the November 1961 issue of 73. Complete with extra November issue. $1.00

Radio Bookshop

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We were doing some cleaning of the Radio Bookshop shelves and found a vast collection of single copies of various books. Many of them are still available from the publishers, but some are out of print and are rapidly becoming rare. In order to make our fall inventory easy we will offer these books at a price, which in many cases is less than our cost. First come, first served basis.

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QRG Calibration Log	2.00	1.00
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Surplus Schematics Handbook	2.50	1.75
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TV Signal Range Calculator		.50
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24—BETTER SHORT WAVE RECEPTION—Orr (W6SAI). How to buy a receiver, how to tune it, align it, building accessories; better antennas; QSL's, maps, aurora zones, CW reception, SSB reception, etc. Handbook for short wave listeners and radio amateurs. **$2.85**

26—S9 SIGNALS—Orr (W6SAI). A manual of practical detailed data covering design and construction of highly efficient, inexpensive antennas for the amateur bands that you can build yourself. **$1.00**

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Radio Handbook, 15th Edition, written by Bill Orr W6SAI, over 800 pages. Covers every phase of amateur radio from the very basics right up through the construction of just about everything you could want in ham gear. Originally published at $8.50. Superceded by the new 16th edition which is the same except for new construction projects and selling for $9.50 (see number 11). Special, until the last few copies are gone, only **$5.95!**

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82—SURPLUS RADIO CONVERSION MANUAL VOLUME NO. III—Original and conversion diagrams, plus some photo of these: 701A, AN/APN-1, AN/CRC-7, AN/URC-4, CBY-29125, 50083, 50141, 52208, 52232, 52302-09, FT-ARA, BC-442, 453-455, 456-459, BC-696, 950, 1066, 1253, 241A for xtal filter, MBF (COL-43065), MD-7/ARC-5, R-9/APN-4, R23-R-28/ARC-5, RAT, RAV, RM-52 (53), Rt-19/ARC-4, SCR-274N, SCR-522, T-15/ARC-5 to T-23/ARC-5, LM, ART-13, BC-312, 342, 348, 191, 375. Schematics of APT-5, ASB-5, BC-659, 1335A, ARP-2, APA10, APT-2. **$3.00**

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AMA-1—AMATEUR RADIO ANTENNA HANDBOOK—by Hooton W6TYH. Basic theory, construction and tuning of all the well known and effective ham antennas. Good stuff on feed lines and towers too. **$2.50**

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ASM—AMATEUR RADIO STATION MANUAL. Contains station log, cross index for calls/names, record sheets for WAS, WAC, WAZ, schedules, equipment records, net data, DX records, world prefixes, etc. **$3.95**

BEO—OSCILLATOR CIRCUITS—by Adams. This book is designed for the fellow who really wants to know how electronic circuits work. It is written with incredible simplicity and uses four color diagrams to effectively explain just what happens in circuits. Covers all nine basic oscillator circuits. **$2.95**

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CB3—CITIZENS BAND RADIO MANUAL. Just about everything you will need to know about CB, plus service data on 34 popular models of CB gear: Cadre, Capital, Citi-Fone, Eico, Globe, Gonset, Hallicrafters, Heath, ITT, Lafayette, La Salle, Magnavox, Philmore, Poly-Com, Vocaline, Webcor. **$2.95**

DIT—DIODE CIRCUITS HANDBOOK by Rufus P. Turner. The lowly diode has come into its own these days. Here are nearly 100 diagrams of circuits with discussions and complete explanations of their operation. **$2.50**

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INDEX TO ADVERTISERS

To aid you in finding ads which are not running in this issue we have listed the last ad run by each compay in 73.

87	Aaron	Sept. 63	Glass, J. J.	Sept. 63	Poly-Paks
Cover II	Adcom	11	Gonset	Mar. 63	Polytronics
May 63	Adirondack	103	Goodheart	91	Propagation Products
82	A & F Electromart	78	Graham Radio	July 63	QTH MAPS
Aug. 62	Air	Apr. 63	Grantham School	101	Quaker
Sept. 63	Alco	July 63	Groth	53	Quement
43	Alden	98	Grove	108	Radio Bookshop
July 63	Algeradio	Nov. 62	Ham Aids	Apr. 63	Radio Industries
Sept. 63	Allied	Jun. 62	Ham Boards	79	Radio Publications
83	Alltronics-Howard	Sep. 62	Hamkerchiefs	Dec. 62	Radio Supply & Eng.
Mar. 62	Alvaradio	Dec. 62	Ham Kits	June 62	Raytheon
55	Amateur Elect. Supply	Aug. 63	Ham Trader	July 63	Ready Radials
Feb. 63	Amateur Radio Exchange	Sept. 63	Hallicrafters	84	Redline
Oct. 62	Amatronics	June 63	Hammarlund	Sept. 63	Reed
July 63	American Crystal	Mar. 63	Harrison, Ivan	June 63	Rex
May 63	Amperex	Oct. 61	Harrison Radio	78	Reyco
23	Amplidyne	July 62	Hartman	Oct. 61	Rider
July 63	Amrad	95	Hayden	Apr. 63	Ritco
Apr. 63	Arrow Electronics	17, 18, 19, 49	Heath	July 63	Rohn
June 63	Arrow Sales, Cal.	39, 51	Henry	97	RW Electronics
99	Arrow Sales, Chi.	77	Hi-Par	Sept. 63	Sams
Oct. 62	Ashe	95	Hi-Way	June 62	Sar
106	Badges	38	Holstrom	Feb. 63	Schober
Sept. 63	Bald Eagle	Sep. 62	Hornet	Mar. 62	Seco
Nov. 62	Barrington	Aug. 63	Howard	Aug. 62	SEG Sales
Nov. 62	Barry	21	Hunter	Feb. 62	Shure
Jun. 62	Bay Roy	112	Hy Gain	Aug. 63	Sideband Engineers
99	BC Electronics	May 63	Instructograph	Nov. 62	Signal
Apr. 63	Best	5	International Crystal	Apr. 63	S. J. Electronics
27	BF	June 63	Irving Electronics	July 63	Skylane
Oct. 61	British Radio	91	Jays	July 63	Slep
75	Burghardt	13	J & D Labs	105	Space
May 62	Burk	98	Jefftronics	June 63	Space Raider
39	B & W	Sep. 61	Jennings	May 63	Sprague
Sept. 63	Byron Airpack	28	Johnson	7	Squires-Sanders
82	Calamar	Aug. 61	JSH Electronics	June 63	Star
89	Callbook	Jan. 63	Kar-Tenna	93	Subscriptions
Aug. 63	Candee	Sept. 63	KTV Towers	July 63	Super-Q
June 63	C & H	June 63	Ladd	25	Swan
July 63	Charter Oak	3	Lafayette Radio	June 63	T A B
6	Clegg	Mar. 62	Lefor	Feb. 63	Technical Manuals
35	Cleveland Institute	Nov. 62	Limachi	45	Technical Material
July 63	Collins	Cover II	Linear Systems	June 63	Telemarine
Sept. 63	Columbia	Mar. 61	L R Electronics	27, 83	Telrex
May 63	Columbia Products	Oct. 62	L W Electronics	Apr. 63	Tepabco
82	Comaire	July 63	Maps	July 62	Texas Crystal
Aug. 63	Cornell-Dubilier	Apr. 63	Master Mobile	Apr. 62	Texonic
July 63	Cubex	May 63	McCoy	80	Topaz
21, 78	Cushcraft	May 61	Mercury	Jan. 63	Transceivers
July 62	Davco	Aug. 62	Mesco	99	Transistors Ult.
Apr. 63	Delta	111	Meshna	Sept. 63	Tri-Ex
91	Denson	May 63	Metrodynamics	June 63	Tri-State
41, 98	Dow Key	95	Midwest	Aug. 63	United
38	Dow Radio	June 63	Miller	Feb. 63	US Crystals
41	Drake	July 63	Mini-Products	Sept. 63	U. T. C.
Mar. 63	Ebco	80	Mission	Apr. 63	Valley
33	Editors & Engineers	July 63	M & M	82, 97, 100	Vanguard
Feb. 63	Ed-U-Cord	Jun. 61	Mobiliers	101	Verns
Feb. 62	EICO	Jan. 63	Mor-Gain	July 63	Versatronics
Mar. 63	Electro-com	Sept. 63	Mosley	Feb. 63	Vesto
June 63	Electronic Servicenter	Sept. 62	Multi-Products	July 63	V & H
May 62	Electrophysics	Cover IV	National	Jan. 63	Vibroplex
82	Emrad	May 63	New Products	103	WA6DUW
83	Epsilon Records	Aug. 63	Newtronics	Dec. 62	Waber
13	Evans	July 63	North American	37	Waters
4	E-Z Way	101	Northwest	Sept. 63	Webster
97	Fair	Dec. 62	Nortronics	July 62	Wegner
July 63	Fairbrother	Aug. 63	Ole's	100	Western (Calif.)
77	Fichter	Mar. 62	Organs & Electronics	83	Western (Neb.)
81	Finney	May 63	Out-O-Door	83	Wildcat Press
93	F-M	Dec. 62	Pacific Electronics	28, 81, Cover III	World Radio Labs
Aug. 63	Foreign Projects	June 63	Palmer	Apr. 62	Zalytron
16	Foreign Subs	80	Parks	93	73 Subscriptions
Aug. 62	Fort Wayne	47	Pausan	107	73 Products
100	Gain, Inc.	Dec. 61	Penwood Numechron	106	73 Parts Kits
Feb. 63	Gam	Dec. 61	Peterson	54	5, 7, 9, Magazine
23	Gavin Instruments	31, 38	P & H	16	6 Up
Sept. 63	Gem Electronics				

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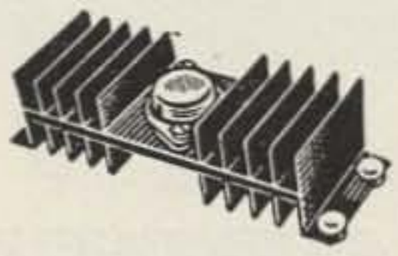

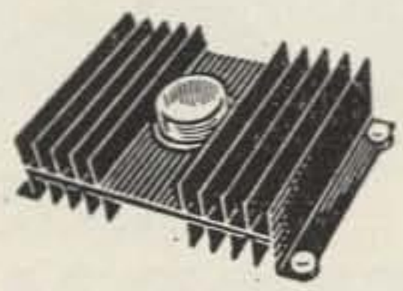

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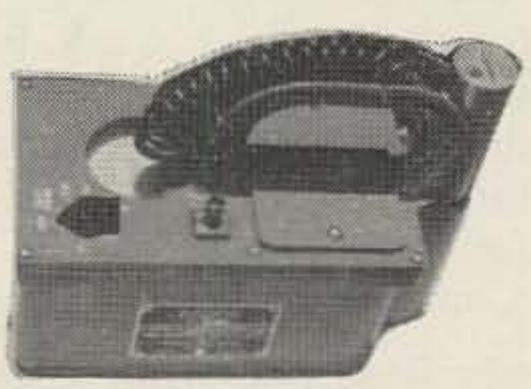

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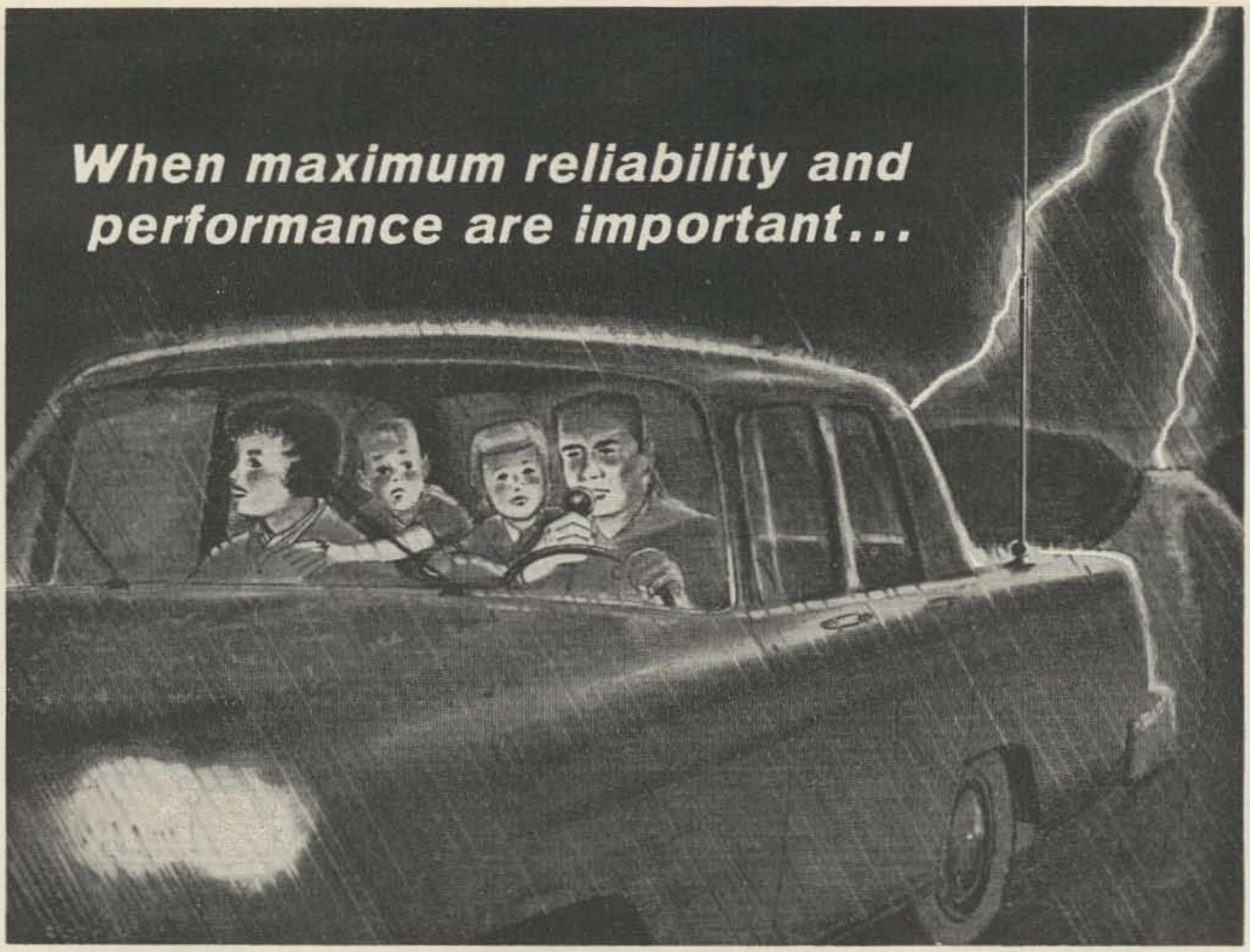

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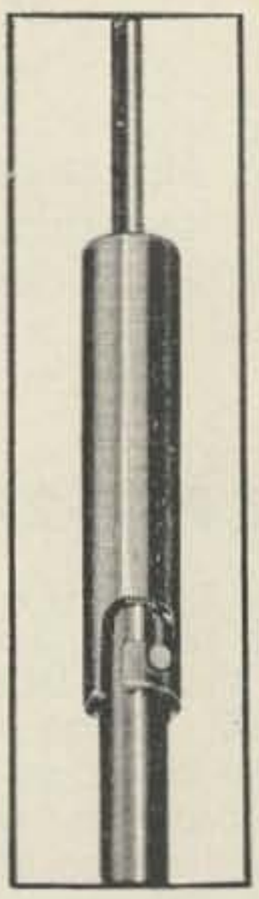

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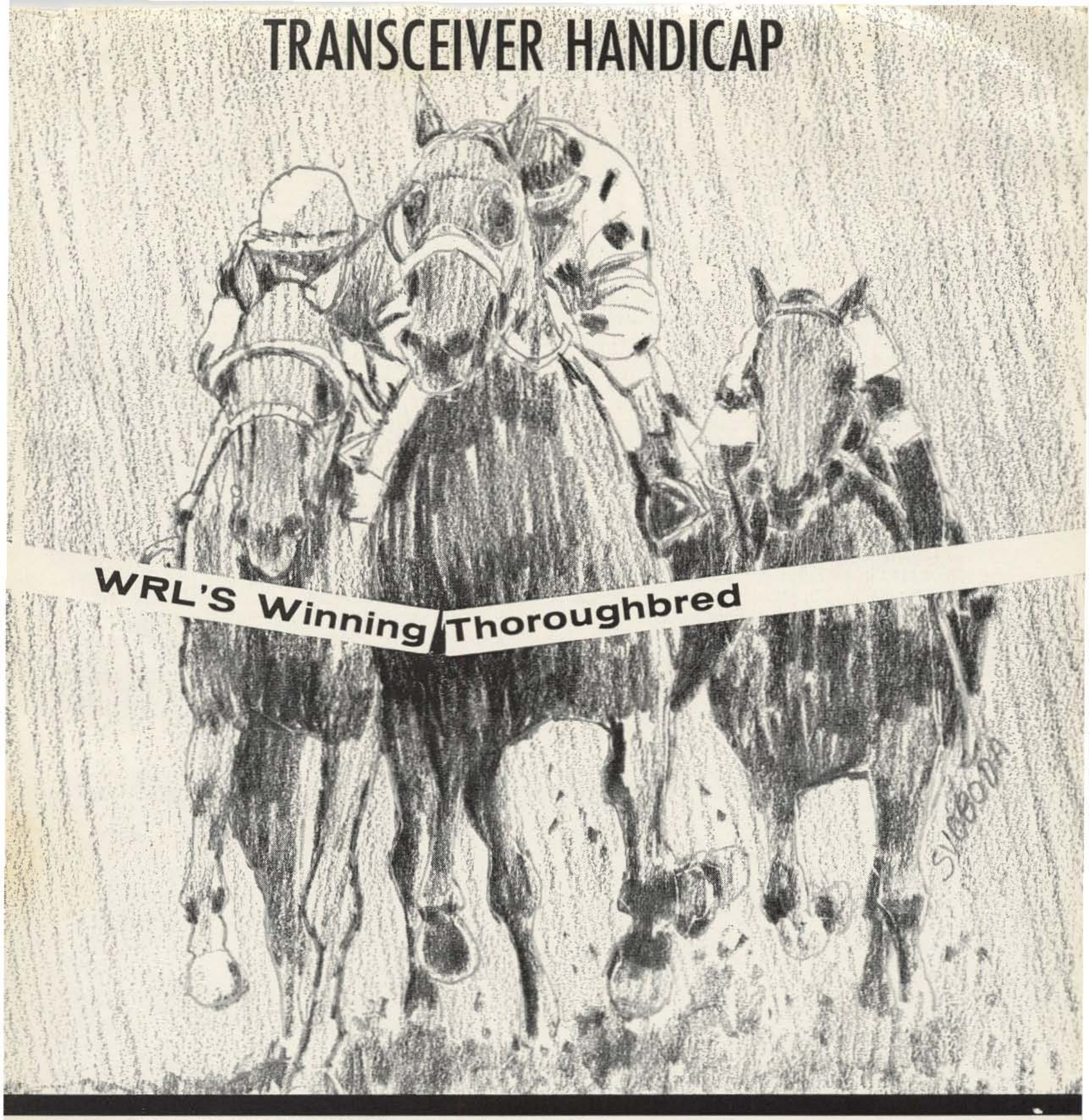

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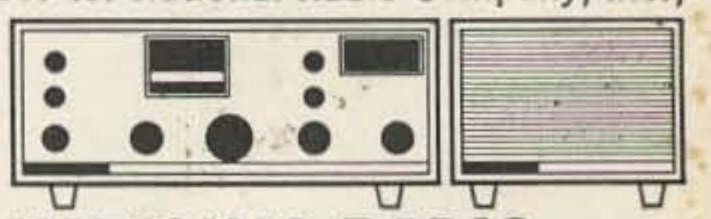

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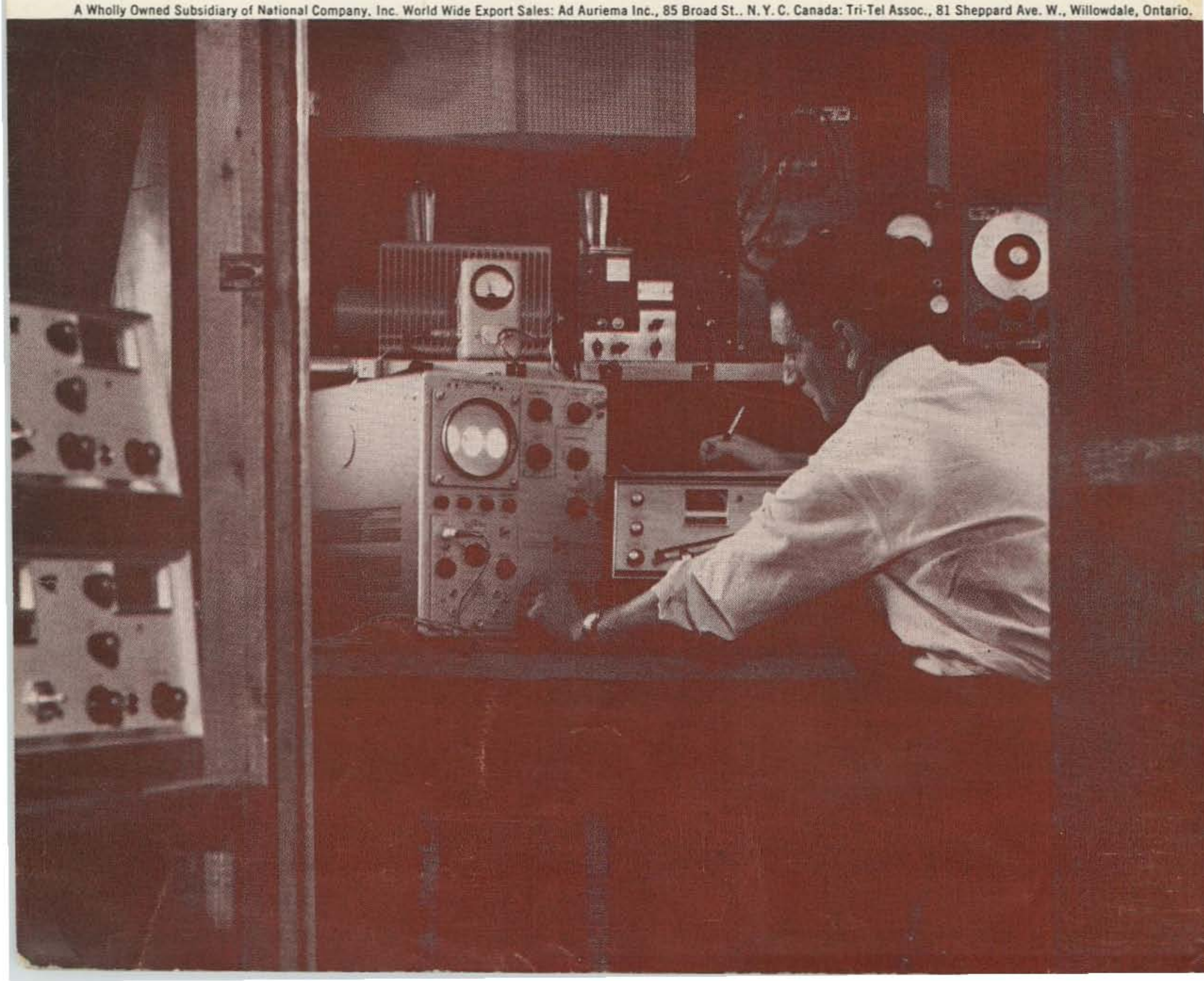
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